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Fe-rich antigorite: a rock-forming mineral from low-temperature/high-pressure meta-ophicarbonates

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Fe-rich antigorite: A rock-forming mineral from low-temperature/high-pressure meta-ophicarbonates --Manuscript Draft--

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Abstract:	<p>This study provides the first characterization of Fe-rich antigorite (FeOtot up to 12 wt%), a rock-forming mineral occurring in ophicarbonate rocks from different low-temperature/high-pressure meta-ophiolitic suites: Acceglio (Traversiera Valley, external Piemonte Zone, NW Italy), Macedonia and Verias (Thessaloniki and Vurinos-Kozani ophiolitic complexes, NE Greece), Tinos (Tinos Island, Cyclades Archipelago, Greece). Fe-rich antigorite has been characterized through optical and transmission electron microscopy, and its mineral chemistry has been investigated by means of WDS and TEM-EDS techniques.</p> <p>In thin section, Fe-rich antigorite is characterized by a strong, peculiar pleochroism (α = green to dark green; γ = bright-yellow to orange). It occurs in both mesh and bastite microstructures, and it is locally associated with relics of lizardite and/or chrysotile. The modulated lattice parameters of disordered Fe-rich antigorites have been determined by electron diffraction in the transmission electron microscope. The values are highly variable, even within each ophicarbonate sample. Verias dominantly has a superlattice parameter a clustering around 43.5 Å (corresponding to the $m = 17$ polysome); Tinos and Macedonia have around 35.4 Å ($m = 14$); Acceglio may even go down to 29 Å ($m = 12$). Globally, the disorder features (i.e., reduced size of crystals, polysomatic faults, wobbling, misalignment among sublattice and superlattice reflections, etc.) increase from Macedonia to Verias, Tinos and Acceglio, respectively. The analyzed Fe-rich antigorites accommodate up to 12 wt% FeOtot: Macedonia and Acceglio are richer in Fe than Tinos and Verias, with XFe values $[XFe = Fetot / (Mg + Fetot)]$ in the range 0.10-0.16 for Macedonia, 0.05-0.17 for Acceglio, 0.10-0.12 for Tinos and 0.05-0.10 for Verias. The intensity of the pleochroism seems to be directly correlated with the Fe content, with the Fe-richer samples showing the deeper absorption colours.</p> <p>Mineral relationships and TEM observations suggest that Fe-rich antigorite replaces former mesh and bastite microstructures consisting of lizardite $\pm$ chrysotile, only locally preserved as relict phases. The thermodynamic modelling approach (i.e., P/T-X(CO₂) pseudosection) qualitatively shows that the stability of Fe-rich antigorite is compatible with low-temperature, high-pressure conditions (i.e., blueschist-facies metamorphic conditions), and is enhanced by the occurrence of CO₂ in the fluid, consistent with the systematic occurrence of this mineral in meta-ophicarbonate rocks.</p>
Keywords:	Fe-rich antigorite; meta-ophicarbonates; Transmission Electron Microscopy; thermodynamic modelling; blueschist-facies metamorphism; H ₂ O-CO ₂ fluid
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Cover Page

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Running title

Fe-rich antigorite from LT-HP meta-ophicarbonates

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Abstract

This study provides the first characterization of Fe-rich antigorite (FeO_{tot} up to 12 wt%), a rock-forming mineral occurring in ophicarbonate rocks from different low-temperature/high-pressure meta-ophiolitic suites: *Acceglio* (Traversiera Valley, external Piemonte Zone, NW Italy), *Macedonia* and *Verias* (Thessaloniki and Vurinos-Kozani ophiolitic complexes, NE Greece), *Tinos* (Tinos Island, Cyclades Archipelago, Greece). Fe-rich antigorite has been characterized through optical and transmission electron microscopy, and its mineral chemistry has been investigated by means of WDS and TEM-EDS techniques.

In this section, Fe-rich antigorite is characterized by a strong, peculiar pleochroism (α = green to dark green; γ = bright-yellow to orange). It occurs in both mesh and bastite microstructures, and it is locally associated with relics of lizardite and/or chrysotile. The modulated lattice parameters of disordered Fe-rich antigorites have been determined by electron diffraction in the transmission electron microscope. The values are highly variable, even within each ophicarbonate sample. *Verias* dominantly has a superlattice parameter a clustering around 43.5 Å (corresponding to the $m = 17$ polysome); *Tinos* and *Macedonia* have around 35.4 Å ($m = 14$); *Acceglio* may even go down to 29 Å ($m = 12$). Globally, the disorder features (*i.e.*, reduced size of crystals, polysomatic faults, wobbling, misalignment among sublattice and superlattice reflections, etc.) increase from *Macedonia* to *Verias*, *Tinos* and *Acceglio*, respectively. The analyzed Fe-rich antigorites accommodate up to 12 wt% FeO_{tot} : *Macedonia* and *Acceglio* are richer in Fe than *Tinos* and *Verias*, with X_{Fe} values [$X_{\text{Fe}} = \text{Fe}_{\text{tot}}/(\text{Mg} + \text{Fe}_{\text{tot}})$] in the range 0.10-0.16 for *Macedonia*, 0.05-0.17 for *Acceglio*, 0.10-0.12 for *Tinos* and 0.05-0.10 for *Verias*. The intensity of the pleochroism seems to be directly correlated with the Fe content, with the Fe-richer samples showing the deeper absorption colours.

Mineral relationships and TEM observations suggest that Fe-rich antigorite replaces former mesh and bastite microstructures consisting of lizardite $\pm$ chrysotile, only locally preserved as relict phases. The thermodynamic modelling approach (*i.e.*, P/T - $X(\text{CO}_2)$ pseudosection) qualitatively shows that the stability of Fe-rich antigorite is compatible with low-temperature, high-pressure conditions (*i.e.*, blueschist-facies metamorphic conditions), and is enhanced by the occurrence of CO_2 in the fluid, consistent with the systematic occurrence of this mineral in meta-ophicarbonate rocks.

Key-words

Fe-rich antigorite, meta-ophicarbonates, Transmission Electron Microscopy, thermodynamic modelling, blueschist-facies metamorphism, H_2O - CO_2 fluid

1. Introduction

The serpentine minerals are composed of Si_2O_5 tetrahedral sheets alternating with $\text{Mg}_3(\text{OH})_4$ octahedral sheets, stacked along the *c* axis (Wicks & O'Hanley, 1988; Evans *et al.*, 2013, and references therein). The different serpentine minerals are not real polymorphs. Lizardite, polygonal serpentine and chrysotile have the ideal general formula $^{\text{VI}}\text{M}_3^{\text{IV}}\text{T}_2\text{O}_5(\text{OH})_4$, where *M* = Mg, Fe^{2+} , Ni, Al, and *T* = Si, Al, Fe^{3+} ; antigorite deviates because of discrete $\text{Mg}(\text{OH})_2$ loss (Mellini *et al.*, 1987). The structure of lizardite is based upon flat 1:1 layers (Mellini & Viti, 1994). Chrysotile has a cylindrical structure resulting from curled 1:1 layers (Wicks & O'Hanley, 1988). Antigorite has a modulated wave-like 1:1 layer, with polarity inversion every half wavelength (Capitani & Mellini, 2004). The variable modulation gives rise to a polysomatic series, with general formula $\text{M}_{3m-3}\text{T}_{2m}\text{O}_{5m}(\text{OH})_{4m-6}$, *m* being the number of tetrahedra within a wavelength (Mellini *et al.*, 1987; Otten, 1993).

In undeformed ultramafic rocks, serpentine resulting from peridotite hydration develops microstructures typical of retrograde metamorphic conditions, namely mesh and bastite microstructures after olivine and orthopyroxene, respectively (Moody, 1976; Dungan, 1979a,b; O'Hanley & Dyar, 1993). Lizardite dominates in the mesh rims, whereas mesh cores and bastites mainly consist of lizardite, polygonal serpentine and chrysotile (Viti & Mellini, 1998). Conversely, antigorite is the typical metamorphic serpentine mineral, stable from greenschist- to low-amphibolite- and eclogite-facies conditions (Trommsdorff & Evans, 1972, 1977a,b; Dungan, 1979b; Mellini *et al.*, 1987; Evans, 2004).

We now report the occurrence of a rock-forming Fe-rich antigorite (up to 12 wt% FeO_{tot}) replacing former mesh and bastite microstructures consisting of lizardite $\pm$ chrysotile, these last only locally preserved as relict phases. Fe-rich antigorite is easily recognizable in thin section for its marked pleochroism, variable from green to bright-yellow and orange. Serpentine minerals with similar optical features have been previously reported by other authors (*e.g.*, Frondel, 1962; Dietrich, 1972; Driesner, 1993; Groppo, 2005), but their unambiguous identification as antigorite was not given. This study thus provides the first characterization of this rock-forming mineral by means of different techniques (*i.e.*, optical microscopy, transmission electron microscopy and wavelength-dispersive electron microprobe). The systematic occurrence of Fe-rich antigorite in low-temperature/high-pressure (LT-HP) meta-ophicarbonate rocks (serpentinite breccias with carbonate cement) suggests that its stability could be favoured by LT-HP metamorphic conditions and could be enhanced by the presence of CO_2 -bearing fluids, as further confirmed, at least qualitatively, by the thermodynamic modelling approach.

2. Samples and methods

2.1 Samples

Fe-rich antigorite has been identified during the systematic study of ophicarbonates used as dimension stones (Di Pierro, 1997). Various ophicarbonate samples from four different localities contain Fe-rich antigorite. The first ophicarbonate, trade name *Verde Acceglio*, is quarried near Acceglio village, Val Maira (ca. 44°28'51''N, 6°58'51''E), from the roof of the serpentinitic basement of the meta-ophiolitic complex of the Traversiera Valley (Schwartz *et al.*, 2000). The *Verde Acceglio* ophicarbonate belongs to the external Piemonte Zone, Western Alps, which underwent peak metamorphism under medium-temperature (350–400°C) blueschist-facies conditions (Schwartz *et al.*, 2000, 2013). The second ophicarbonate (*Green Tinos*) is quarried in the northern portion of Tinos Island (ca. 37°40'29''N, 25°00'28''E), Cyclades Archipelago, Greece. The *Tinos* ophicarbonate is part of an ophiolitic sequence, including also serpentinitized harzburgite and metagabbro (Stolz *et al.*, 1997). The ultramafic rocks reported from the Island of Tinos consist of antigorite-bearing serpentinites and ophicarbonates partly assigned to the low-*T* and high-*P* eclogite- to blueschists-facies units of the Cyclades Archipelago (Stolz *et al.*, 1997; Ring & Layer, 2003). The other two samples (*Green Macedonia* and *Green Verias*) are ophicarbonates from NW Macedonia, Greece. *Green Macedonia* belongs

to the Thessaloniki ophiolite nappes, and *Green Verias* to the Vurinos-Kozani ophiolitic complex, located respectively west and east of the city of Veria (ca. 41°31'10"N, 22°12'07"E) (Tsikouras & Hatzipanagiotou, 1998). The *Green Verias* and the *Green Macedonia* are both derived from blueschist-facies units.

2.2 Microscopy and microanalysis

The rocks were studied in polished thin sections by optical microscopy and electron microprobe microanalysis (Cameca SX 50 Electron Microprobe, EMPA) with wavelength dispersive spectrometers, WDS, at the Geologisches Institut, the University of Bern. Operating conditions were 15 kV and 20 nA. The following natural silicates and oxides were used as standards: almandine (Fe), spinel (Mg), orthoclase (K, Si), anorthite (Ca, Al), eskolaite (Cr), tephroite (Mn), albite (Na), ilmenite (Ti) and bunsenite (Ni). Transmission electron microscopy (TEM) analyses were carried out at the Department of Physical Sciences, Earth and Environment, the University of Siena, on polished thin sections (ion-milled to electron transparency) by a JEOL 2010 microscope working at 200 kV, equipped with an energy dispersive spectrometer (EDS).

2.3 Thermodynamic modelling

A $P/T-X(\text{CO}_2)$ pseudosection was calculated in the CFMAS-HC (CaO-FeO-MgO-Al₂O₃-SiO₂-H₂O-CO₂) system along a 7°C km⁻¹ gradient, compatible with the blueschist-facies metamorphism experienced by the studied samples. O₂ was neglected, due to the current unavailability of a solution model considering the Fe³⁺ exchange in antigorite. A generic Iherzolitic bulk composition (SiO₂=41, Al₂O₃=1, MgO=50, FeO=5, CaO=3 mol%) was used, and the binary H₂O-CO₂ fluid was considered in excess. The pseudosection was calculated using Perplex 6.8.6 (version February 2019; Connolly, 1990, 2005, 2009), the internally consistent thermodynamic dataset of Holland & Powell (2011) (ds62) and the equation of state for H₂O-CO₂ fluid of Holland & Powell (1998). The following solution models were used: olivine (Holland & Powell, 1998), antigorite (Padrón-Navarta *et al.*, 2013), clinopyroxene and orthopyroxene (Holland & Powell, 1996), chlorite (Holland *et al.*, 1998), tremolite, talc and brucite (ideal models; Connolly, 1990). Aragonite was considered as a pure phase.

3. Results

3.1 Optical properties

Only *Green Macedonia* will be described in detail, because the optical properties of Fe-rich antigorite are the same in the four studied ophiocarbonates. Structurally, the rock is a breccia composed of serpentinite fragments cemented by a network of calcite veins. Serpentine, more than 50 vol%, occurs both in mesh and bastite microstructures (Fig. 1), apparently pseudomorphous after olivine and orthopyroxene, respectively (Viti & Mellini, 1998). The mesh microstructure consists of a pleochroic serpentine (mostly identified as Fe-rich antigorite under the TEM, see section 3.2), and minor carbonate and magnetite (Fig. 1). This serpentine has a lamellar habit and defines a mesh microstructure characterized by two sets of orientations cross-cutting each other at about 60°, most likely due to moderate tectonic deformation. Carbonate and minor subhedral magnetite occur in the mesh core, with magnetite mostly localized at the intermesh boundaries. Bastites, mainly consisting of a similar pleochroic serpentine (also identified as Fe-rich antigorite at the TEM), normally do not show magnetite and carbonate (Figs. 1a,b). Accessory diopside, locally replaced by tremolite, and Cr-rich spinel replaced by magnetite at the rims (the so-called “ferritchromite”; *e.g.*, Mellini *et al.*, 2005) are present as well. The relative proportions of mesh and bastite, which correspond in the peridotite protolith to olivine and orthopyroxene, respectively, and the limited presence of clinopyroxene relics, suggest either a Cpx-poor Iherzolite or a harzburgite protolith. Representative microstructures for *Green Macedonia* and *Acceglio* are shown in Fig. 1.

181 Unlike common antigorite, normally colourless to pale green, Fe-rich antigorite is strongly pleochroic
182 with α = green to dark green and γ = bright yellow to orange (Fig. 1), has low relief (consistent with that of
183 “normal” antigorite; Deer *et al.*, 1992), no evident cleavage, and positive elongation. Under crossed
184 polarizers, in the mesh pseudomorphs, Fe-rich antigorite shows low to very-low birefringence with
185 anomalous brownish-yellow to grey-green interference colours (Figs. 1c,f), whereas in the bastite
186 pseudomorphs birefringence is higher (δ = 0.025, Fig. 1c). The difference in birefringence is possibly due to
187 different chemical compositions (see EMPA data in section 3.3). In the veins, Fe-rich antigorite looks fibrous
188 with fiber elongation orthogonal to the vein selvages (Fig. 1f). Fe-rich antigorite is biaxial with $2V_{\alpha} \approx 20^{\circ}$,
189 definitely smaller than in “normal” antigorite ($2V_{\alpha} \approx 37 - 61^{\circ}$; Deer *et al.*, 1992). Due to the very fine grain-
190 size of both mesh and bastite microstructures, the above reported optical characteristics (in particular the
191 $2V$) must be considered with care, having been obtained not from a single crystal but from fine-grained
192 aggregates of sub-microscopic intergrowth of crystals with a preferred orientation. Chrysotile and fine-
193 grained colourless antigorite have additionally been observed in veins of *Green Tinos*.
194

195 3.2 Transmission electron microscopy (TEM) characterization

196 Reliable characterization of serpentine minerals may be obtained by transmission electron microscopy
197 (TEM). In fact, chrysotile, lizardite, polygonal serpentine and antigorite often occur as fine-grained, intimately
198 intergrown crystals (Wicks & O'Hanley, 1988; O'Hanley, 1996; Mellini *et al.*, 2002), thus preventing their
199 unambiguous identification by means of optical microscopy or scanning electron microscopy.

200 TEM images and diffraction patterns along with EDS analyses confirmed the presence of Fe-rich
201 antigorite in all the ophicarbonates samples, with remarkable differences both from sample to sample and
202 within the same sample. Fe-rich antigorite is almost the only serpentine mineral in *Green Macedonia* and
203 *Green Verias*, where it occurs as lath-shaped, submicrometer sized, highly faulted crystals (*e.g.*, Fig. 2a),
204 whereas it is the dominant serpentine phase in *Green Tinos* and *Acceglio* samples, where it forms smaller,
205 fish-shaped, poorly ordered crystals, always associated with relict chrysotile and lizardite (*e.g.*, Fig. 2b).

206 Reliable, statistically significant determination of the superlattice parameter a was markedly
207 hampered by the limited order of these antigorites, suffering from tiny crystal size, important polysomatic
208 disorder, evident offset effects (*i.e.*, mutual rotation between sublattice and superlattice vectors; *e.g.*, inset
209 of Fig. 2a). These are features typical of poorly annealed antigorite, suffering from concerted polysomatic
210 faults, known as wobbling (*e.g.*, Otten, 1993). Globally, a values range from ~ 43.5 Å to ~ 29.1 Å, with the most
211 recurrent values close to 35.4 Å. *Verias* dominantly has a superlattice parameter a clustering around 43.5 Å
212 ($m = 17$ polysome); *Tinos* and *Macedonia* have around 35.4 Å ($m = 14$); *Acceglio* may even go down to 29 Å
213 ($m = 12$). The disorder features increase from *Macedonia* to *Verias*, *Tinos* and *Acceglio*, respectively.

214 Mellini *et al.* (1987) and Padrón-Navarta *et al.* (2008) reported low m values, in the range 13-17 for
215 HT metamorphic antigorites (Valmalenco and Cerro del Almirez antigorites, respectively), whereas higher m
216 values, up to 23, are reported by Mellini *et al.* (1987) for LT antigorites, suggesting the existence of an inverse
217 relation between m parameter and metamorphic annealing. The same general correlation has been
218 confirmed for synthetic antigorite by Wunder *et al.* (2001). However, m values between 13 and 19 (namely,
219 shorter than expected) are common also in the low- to very-low-grade vein antigorites from Elba (Viti &
220 Mellini, 1996). Similarly, m values between 12 and 16 have been reported for oceanic serpentinites from the
221 Mid-Atlantic Ridge, for which a formation temperature $< 300^{\circ}\text{C}$ was estimated based on oxygen isotope data
222 (Ribeiro da Costa *et al.*, 2008); in that case, the low m values combined with the highly disordered state of
223 the analyzed antigorite were interpreted to be related to low temperature, incipient crystallization rather
224 than as a sign that antigorite formed at high temperatures. Finally, m values in the range 16-21 are reported

for HP antigorites from the western Alps (Monviso Massif; Auzende *et al.*, 2006). Our data seem to duplicate the latter cases, showing low m values even in rocks from LT-HP settings.

227

228 3.3 Mineral chemistry (WDS and TEM-EDS)

229 Selected representative EMPA analyses are reported in Table 1; the complete sets of analyses for the four
230 studied samples are reported as supplementary material in Tables SM1-SM4 and plotted in Fig. 3. Antigorite
231 analyses have been normalized on the basis of the total cations (a.p.f.u.) corresponding to each polysome
232 (*i.e.*, $\Sigma\text{cat}=4.824$ for the $m=17$ *Verias* antigorite, $\Sigma\text{cat}=4.786$ for the $m=14$ *Macedonia* and *Tinos* antigorites
233 and $\Sigma\text{cat}=4.750$ for the $m=12$ *Acceglio* antigorite). Chemical compositions of Fe-rich antigorite are quite
234 homogeneous, with low standard deviations (≈ 1 wt%). The SiO_2 content, in the range 41-42 wt%, is obviously
235 lower than in Fe-poor antigorite, in which it is generally around 45 wt% (Trommsdorff & Evans, 1972; Dungan,
236 1979b; Uehara & Shirozu, 1985). MgO ranges from 33.4 to 38.2 wt% and seems to be unevenly distributed
237 between mesh and bastite domains. MnO is present as traces, max 0.11 wt%, while NiO , up to 0.52 wt%, is
238 more significant. Substantial amounts of Cr_2O_3 occur in the Fe-rich antigorite from the *Macedonia* bastites,
239 up to 0.32 wt%, and *Tinos* mesh, max 0.68 wt%. Al_2O_3 and Cr_2O_3 contents are generally significantly lower in
240 mesh than in bastite antigorite (*e.g.*, *Macedonia*, Table 1 and Fig. 3b). Similar systematic Al and Cr enrichment
241 in bastite serpentinite relative to Ni-rich mesh serpentinite is known from the Durrington-Sultan Complex
242 retrograde serpentinites, California (Dungan, 1979b), and from Elba Island, Italy (Viti & Mellini, 1998). These
243 values have been interpreted as inherited from the pristine compositions of the former olivine and
244 orthopyroxene.

245 The most unusual feature of Fe-rich antigorite is its iron content. The *Macedonia* and *Acceglio* Fe-rich
246 antigorites accommodate up to 12 wt% FeO_{tot} , in contrast with the average FeO_{tot} content of 2-4 wt.%
247 reported elsewhere for antigorite (*e.g.*, Evans, 1972, 1977a,b; Dungan, 1979b; Uehara & Kamata, 1994;
248 O'Hanley, 1996; Viti & Mellini, 1996; Trommsdorff & Trommsdorff *et al.*, 1998; Mellini *et al.*, 2002; Capitani
249 & Mellini, 2004; Padrón-Navarta *et al.*, 2008; Evans *et al.*, 2012; Debret *et al.*, 2014). Overall, *Macedonia* and
250 *Acceglio* antigorites are richer in Fe than *Tinos* and *Verias* antigorites, with X_{Fe} values [$X_{\text{Fe}}=\text{Fe}_{\text{tot}}/(\text{Mg}+\text{Fe}_{\text{tot}})$] in
251 the range 0.10-0.16 for *Macedonia*, 0.05-0.17 for *Acceglio*, 0.10-0.12 for *Tinos* and 0.05-0.10 for *Verias* (Fig.
252 3a). The Fe content of Fe-rich antigorite seems to control the intensity of the pleochroic absorption: the
253 deeper orange and green colours, in fact, have been noted in the Fe-richer samples (*Macedonia* and
254 *Acceglio*), whereas the Fe-poorer *Verias* antigorite has lighter absorption colours.

255 The most recent Mössbauer (Evans *et al.*, 2012) and micro-XANES (Debret *et al.*, 2014, 2015) data on
256 antigorite samples show that Fe can occur in both bivalent and trivalent states. Therefore, the question of
257 the Fe oxidation state in the studied Fe-rich antigorites cannot be ignored. Assuming an ideal Tschermak's
258 $(\text{Fe}^{3+},\text{Al})_2\text{Mg}_{-1}\text{Si}_{-1}$ substitution, as suggested by Evans *et al.* (2012), the Fe^{3+} content in antigorite may be
259 tentatively calculated from microprobe analyses as $\text{Fe}^{3+} \text{ a.p.f.u.} = 2 \times (2\text{-Si-Al}/2\text{-Cr}/2)$. This assumption is based
260 on the hypothesis that half of all trivalent cations inversely correlate 1:1 with Si, and that Al^{3+} and Fe^{3+} are
261 equally distributed in the tetrahedral and octahedral sites. Fig. 3b shows that most of the analyzed Fe-rich
262 antigorites are characterized by a deficiency in the occupation of the T sites, which is potentially a measure
263 of half the total Fe^{3+} , except for the bastite Fe-rich antigorites, which mostly plot along the ideal Tschermakite
264 substitution line or slightly above it. It is worth noting that such a calculation may be affected by numerous
265 uncertainties, well explained by Evans *et al.* (2012), and should be therefore considered with care. Apart from
266 the possible analytical uncertainties, false x-values in Fig. 3b may be due to: (i) the presence of undetected
267 amounts of chrysotile or lizardite impurities, as suggested by observations under TEM (see section 3.2)
268 and/or (ii) the use of an inappropriate total cations formula, *i.e.* the presence of m values locally (at the point
269 analysis) different from the most frequent value used for the normalization purpose. Both these possible

sources of uncertainties are very probable in the studied samples, and may partially explain the sub-horizontal trends that characterize most of the samples in Fig. 3b. Fig. 3c is a direct derivative of Fig. 3b and is a plot of the calculated Fe^{3+} (a.p.f.u.) vs. the measured Fe_{tot} (a.p.f.u.). Fig. 3c shows that: (i) the measured Fe_{tot} is in the range 0.12–0.48 a.p.f.u.; (ii) for most of the analyzed antigorites the calculated Fe^{3+} is positive, except for the bastite antigorites (differentiated from mesh antigorite only for the *Macedonia* sample) that have a negative Fe^{3+} , suggesting that they do not respect the assumption of an ideal Tschermak's substitution; (iii) the calculated $\text{Fe}^{3+}/\text{Fe}_{\text{tot}}$ ratio is highly variable, ranging between 0.0 and 0.8, with relatively high average values between 0.3 and 0.5, depending on samples; the *Acceglio* and *Tinos* Fe-rich antigorites have the highest and lowest $\text{Fe}^{3+}/\text{Fe}_{\text{tot}}$ ratios, respectively. Evans *et al.* (2012) showed that the Fe^{3+} calculated from microprobe analyses is generally overestimated with respect to Fe^{3+} measured by Mössbauer spectroscopy. Therefore, we can argue that the $\text{Fe}^{3+}/\text{Fe}_{\text{tot}}$ ratios calculated for the studied Fe-rich antigorites represent maximum values. Although the reliability of Fe^{3+} measurement/calculation in serpentine minerals is still a highly debated issue (*e.g.*, Evans *et al.*, 2013; Beard & Frost, 2017), it is worth noting that the $\text{Fe}^{3+}/\text{Fe}_{\text{tot}}$ ratios calculated for the studied Fe-rich antigorite are comparable to those measured in blueschist- to eclogite-facies antigorite samples from the western Alps using the micro-XANES technique (Debret *et al.*, 2014, 2015).

Further detailed analyses aimed at the direct measurement of the Fe^{3+} content are clearly needed to correctly estimate the iron oxidation state in the studied Fe-rich antigorite samples. These estimates are complicated by the fine-grained and disordered nature of the antigorite crystals and are definitively well beyond the aim of this work; however, as suggested by Evans *et al.* (2012), the formula plots of Figs. 3b,c are at best first approximations when the goal is to assess the content of Fe^{3+} in individual antigorites.

290

291 4. Discussion

292 4.1 Other occurrences of Fe-rich antigorite reported in the literature

Antigorites are normally reported as Fe-poor serpentines. Considering that Wicks & O'Hanley (1988) suggested a maximum value of the Fe^{2+} for Mg substitution in antigorite of about 10 wt%, a few published examples effectively show anomalous FeO_{tot} content:

- 296 (i) Frondel (1962) reported jenkinsite, a ferroan-antigorite with more than 20 wt% FeO_{tot} , associated with magnetite and occurring in veins of the O'Neil's mine, New York State. However, Dietrich (1972) questioned the identification of jenkinsite as antigorite.
- 299 (ii) Dietrich & Peters (1971) and Dietrich (1972) reported "Kluft" (vein) Fe-antigorite, pleochroic from yellow to green, associated with greenalite, calcite and dolomite from fissures in ophicarbonate rocks from the Oberhalbstein ophiolitic complex, associated with low-grade lizardite-chrysotile serpentinites. The authors reported FeO_{tot} values up to 12.3 wt%, and confirmed the mineral identification by XRD.
- 303 (iii) Wicks & Plant (1979) reported two antigorite samples (samples 18540 and T179) from prograde serpentinites from Quebec, with FeO_{tot} ranging from 8.4 to 10 wt% and 4.3 to 10.1 wt%, respectively. The authors, unfortunately, did not report the optical features of their Fe-rich antigorite.
- 306 (iv) Uehara & Shirozu (1985) reported antigorite from the Nishisonogi area, Japan, with $\text{FeO}_{\text{tot}} \approx 9$ wt% (samples N81 and N1A), but they did not mention its optical features.
- 308 (v) Driesner (1993) reported Fe-rich antigorite (up to 7.9 wt% of FeO_{tot}) from an ophicarbonate from Châtillon, Aosta Valley, western Alps, and described also mesh-antigorite pseudomorphs after olivine and antigorite + calcite pseudomorphs after orthopyroxene in the opicalcite clasts.
- 311 (vi) Anselmi *et al.* (2000) reported an unusual Fe-rich serpentine mineral, with FeO_{tot} up to 15 wt% and pleochroism from yellow to blue, from the Monti Livornesi serpentinites, Italy, but the authors did not identify the mineral.

313

(vii) Groppo (2005) reported Fe-rich antigorite from an ophiocarbonate from the Argentera Valley (Cesana, western Alps, external Piemontese Zone) with FeO_{tot} up to 14.5 wt%. Fe-rich antigorite, characterized by a strong pleochroism from yellow to deep green, occurs in both mesh and bastite microstructures, with higher FeO_{tot} values in mesh rims. In the mesh core, Fe-rich antigorite is often associated with aragonite and/or partially replaced by fine-grained tremolite. Antigorite and aragonite were identified based on their micro-Raman spectra.

(viii) In a systematic study of natural serpentinites from the western Alps, sampled in order to represent a wide range of metamorphic P - T conditions, Schwartz *et al.* (2013) and Lafay *et al.* (2013) reported unusual Fe-rich antigorite for a serpentinite collected from the medium-temperature (360-390°C, 10-12 kbar) blueschist domain of the Schistes lustrés complex (External Piemonte Zone, Eychassier massif). The FeO_{tot} content ranges from 5.41 to 7.64 wt%; unfortunately, the optical features of this antigorite are not mentioned. Antigorite was identified using micro-Raman spectrometry.

4.2 Factors enhancing the stability of Fe-rich antigorite

Although the studied samples come from different geological settings, they share the following features: (i) they all experienced LT-HP, blueschist-facies metamorphism, and (ii) all of them are ophiocarbonate rocks. Similarly, most of the Fe-rich antigorite reported in the literature comes from ophiocarbonate lithologies and/or from LT-HP metamorphic settings. This suggests that the stability of Fe-rich antigorite could be somehow influenced by the P - T conditions of metamorphism and/or by the occurrence of CO_2 in the metamorphic fluid. In order to test this hypothesis, a thermodynamic approach was used. The approach remains qualitative, due to the current lack of a reliable solution model that considers the Fe^{3+} substitution in antigorite [note that a ferric iron end-member was preliminary incorporated in the antigorite solution model by Evans & Powell (2015), but details on the model are not provided yet]. However, because the studied Fe-rich antigorites are Fe^{2+} -rich (on average the $\text{Fe}^{3+}/\text{Fe}_{\text{tot}}$ ratio ranges from 0.3 to 0.5), the available solution model can be used as a first approximation and the results of thermodynamic modelling are therefore useful to broadly predict the factors controlling the stability of Fe-rich antigorite.

The modelled P / T - $X(\text{CO}_2)$ pseudosection (Fig. 4) is dominated by three- and four-variant fields, with minor two-variant fields. Antigorite is predicted to be stable in the whole P / T - $X(\text{CO}_2)$ range of interest; olivine appears at about 400°C in the absence of CO_2 , but the olivine-in boundary is shifted to significantly higher P - T conditions for small amounts of CO_2 in the fluid [*i.e.*, to 560°C for $X(\text{CO}_2) \geq 0.003$]. Diopside, tremolite and talc are stable at similar P - T conditions but at different $X(\text{CO}_2)$ values, diopside being the phase stable at lower $X(\text{CO}_2)$ conditions and talc at higher $X(\text{CO}_2)$ conditions (*e.g.*, Groppo & Compagnoni, 2007). Orthopyroxene appears at $T > 490^\circ\text{C}$ in the presence of CO_2 and at $T > 580^\circ\text{C}$ in the absence of CO_2 . For this specific bulk composition, the chlorite stability field is limited to very low $X(\text{CO}_2)$ values at $T < 470^\circ\text{C}$. A carbonate mineral (aragonite) is predicted to be stable even at very low values of $X(\text{CO}_2)$, especially at low P - T conditions.

The equilibrium mineral assemblage observed in the studied samples (antigorite + diopside + carbonate) is predicted to be stable in a relatively narrow P / T - $X(\text{CO}_2)$ range of $T < 500^\circ\text{C}$, $P < 20$ kbar and $X(\text{CO}_2) < 0.0015$. The modelled modal amounts of these minerals (Atg: 92; Di: 6; Arg: 2 vol%) are consistent with petrographic observations. The maximum X_{Fe} in antigorite predicted by the modelled compositional isopleths is 0.09, at least for this specific bulk composition. An increase of the FeO content in the bulk composition would result in the increase of X_{Fe} in antigorite [*e.g.*, $X_{\text{Fe}}(\text{Atg})$ up to 0.13 for a bulk FeO of 10 mol%]. The increase of Al_2O_3 in the bulk composition has the opposite effect, favouring the stability of chlorite, which subtracts FeO from the system [*e.g.*, $X_{\text{Fe}}(\text{Atg})$ down to 0.05 for a bulk Al_2O_3 of 5 mol%].

Although the results of the modelled P / T - $X(\text{CO}_2)$ pseudosection should be considered as qualitative, the following points are worth mentioning: (1) the Fe content in antigorite is inversely proportional to the

metamorphic temperature, reaching maximum values at temperatures in the range 300-500°C, depending on the $X(\text{CO}_2)$ of the fluid. The appearance of olivine or orthopyroxene in equilibrium with antigorite invariably coincides with a decrease of X_{Fe} in antigorite (Figs. 4a,b); (2) even small amounts of CO_2 in the fluid enhance the stability of Fe-rich antigorite. At 350°C the predicted $X_{\text{Fe}}(\text{Atg})$ is ~ 0.06 in the absence of CO_2 , whereas it is significantly higher (up to ~ 0.09) for $X(\text{CO}_2) > 0.00001$ (Fig. 4c); the difference between CO_2 -absent and CO_2 -present conditions is even greater at higher temperatures [e.g., at 400°C, $X_{\text{Fe}}(\text{Atg})$ increases from ~ 0.05 to ~ 0.09 if a small amount of CO_2 is present in the fluid]; (3) due to the impossibility of implementing Fe^{+3} -bearing end-members in the antigorite solution model, the $X_{\text{Fe}}(\text{Atg})$ values predicted by the pseudosection modelling are obviously lower than those measured in the studied antigorites. However, the order of magnitude is the same, thus confirming the hypothesis that LT-HP metamorphic conditions and a fluid slightly enriched in CO_2 are key factors favouring the stability of Fe-rich antigorite.

5. Conclusions

Thermodynamic modelling suggests that Fe-rich antigorite formed from the breakdown of lizardite and/or chrysotile, under relatively low- T and high- P conditions and in the presence of a CO_2 -bearing fluid. This model is consistent with the TEM observations of chrysotile and lizardite relics, and fits the regional geotectonic settings of the studied ophicarbonates, reported in the literature as re-equilibrated at blueschist-facies conditions. Hence, Fe-rich antigorite should be considered as a mineral that forms at low geothermal gradients (such as those of subduction zones), under blueschist-facies metamorphic conditions, possibly common in meta-ophicarbonate rocks with similar geodynamic origin and evolution.

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 516

517 Figure captions

518

519 **Fig. 1 (a-c)** – Photomicrographs of *Verde Macedonia*: mesh microstructures (M) composed of lamellar Fe-rich
 520 antigorite (orange to green), subhedral magnetite (black) and carbonate (colourless), this last mostly
 521 concentrated in the mesh cores. Bastites (B) are entirely composed of Fe-rich antigorite. Plane Polarized Light
 522 (PPL) with vibration plane parallel to γ of Fe-rich antigorite (a), parallel to α (b), and under crossed polarizers
 523 (XPL, c). **(d-f)** Photomicrographs of *Verde Acceglio*, where a deformed mesh microstructure is visible,
 524 composed of lamellar Fe-rich antigorite (orange to green), crosscut by discontinuous carbonate veins
 525 (colourless). PPL parallel to Fe-rich antigorite γ (d), parallel to α (e), and XPL (f). Mineral abbreviations are
 526 according Withney & Evans (2010).

527

528 **Fig. 2. (a)** TEM image (bright field) of the *Verias* ophicarbonate showing two lath-shaped Fe-rich antigorite
 529 crystals (dark because in Bragg conditions) with a high density of (001) planar defects (indicated by arrows),
 530 nearly perpendicular to the (100) superstructure lattice fringes. Note also the offset affecting superstructure
 531 diffraction spots around subcell reflections (inset). **(b)** TEM image of the *Tinos* ophicarbonate with diffraction
 532 pattern (inset). Fish-shaped Fe-rich antigorite crystals occur in pseudo-parallel orientation. Some of them,
 533 due to the suitable diffracting conditions, show the typical wide-spaced (100) lattice fringes of the
 534 superlattice modulation (indicated by arrows).

535

536 **Fig. 3. (a)** Fe-rich antigorite compositions plotted in the Mg-Fe_{tot}-(Al+Cr) diagram. Note that *Macedonia* and
 537 *Acceglio* antigorites have higher XFe values than *Tinos* and *Verias* antigorites. The bulk composition used for
 538 the pseudosection modelling is also plotted (black diamond). **(b)** Si vs. (Al+Cr)/2 a.p.f.u. plot for EMPA
 539 analyses of antigorite. The dashed line represents ideal Tschermak's substitution of R³⁺ cations on the T site.
 540 See Evans et al. (2012) (their Fig. 1) for further explanations. **(c)** Calculated Fe³⁺ vs. total Fe a.p.f.u. See Evans
 541 et al. (2012) (their Fig. 2) for further explanations. ACC: *Acceglio*; MAC-m: *Macedonia* (mesh antigorite); MAC-
 542 b: *Macedonia* (bastite antigorite); TIN: *Tinos*; VER: *Verias*.

543

544 **Fig. 4. (a)** *P/T-X(CO₂)* pseudosection calculated in the CFMAS-HC system along a 7°C km⁻¹ geothermal
 545 gradient, contoured for XFe(Atg) (x100). **(b)** and **(c)** are different enlargements of (a). White, light and dark
 546 grey fields are two-, three- and four-variant fields, respectively.

Fig.4

Table1

Table 1. Representative EMPA analyses of Fe-rich antigorite

Σ cat m parameter	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.824 17	4.824 17	4.824 17	4.750 12	4.750 12	4.750 12	4.750 12
Sample Analyses	MAC 85/m	MAC 97/m	MAC 183/b	MAC 187/b	TIN 124	TIN 127	TIN 137	TIN 156	VER 47	VER 78	VER 55	ACC 71	ACC 160	ACC 247	ACC 250
SiO ₂	41.68	40.45	40.78	40.93	40.53	40.08	41.26	40.53	41.30	41.15	42.26	40.29	40.60	40.21	39.85
TiO ₂	0.00	0.03	0.02	0.02	0.02	0.02	0.00	0.02	0.00	0.02	0.01	0.03	0.00	0.05	0.00
Al ₂ O ₃	0.80	1.29	2.86	2.09	1.97	1.86	2.02	2.08	0.20	0.38	0.28	1.23	2.20	1.17	1.05
Cr ₂ O ₃	0.09	0.00	0.28	0.32	0.35	0.36	0.68	0.38	0.03	0.04	0.02	0.00	0.00	0.05	0.07
FeO _{tot}	9.09	11.23	9.50	9.96	7.29	7.46	8.05	7.44	7.30	5.04	5.71	8.46	6.47	11.31	12.23
MnO	0.07	0.10	0.11	0.13	0.06	0.00	0.05	0.03	0.07	0.05	0.07	0.03	0.06	0.06	0.02
MgO	36.10	33.84	33.70	34.75	34.04	35.11	34.75	34.67	37.55	38.20	38.65	36.01	37.07	34.27	33.94
NiO	0.41	0.33	0.32	0.28	0.20	0.23	0.26	0.30	0.52	0.41	0.37	0.07	0.24	0.34	0.11
CaO	0.22	0.26	0.22	0.37	0.35	0.14	0.07	0.17	0.03	0.10	0.08	0.04	0.05	0.05	0.07
Total	88.46	87.52	87.77	88.83	84.81	85.25	87.15	85.62	87.00	85.39	87.45	86.16	86.69	87.50	87.33
Si	1.903	1.889	1.892	1.874	1.929	1.890	1.916	1.908	1.911	1.921	1.932	1.865	1.851	1.861	1.853
Ti	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.002	0.000
Al	0.043	0.071	0.156	0.113	0.110	0.104	0.110	0.115	0.011	0.021	0.015	0.067	0.118	0.064	0.057
Cr	0.002	0.000	0.007	0.008	0.004	0.005	0.008	0.005	0.001	0.002	0.001	0.000	0.000	0.002	0.003
Fe _{tot}	0.347	0.438	0.368	0.381	0.290	0.294	0.313	0.293	0.282	0.197	0.218	0.327	0.247	0.437	0.475
Mn	0.003	0.004	0.004	0.005	0.002	0.000	0.002	0.001	0.003	0.002	0.003	0.001	0.002	0.002	0.001
Mg	2.456	2.354	2.328	2.370	2.413	2.466	2.404	2.430	2.588	2.656	2.633	2.483	2.518	2.362	2.352
Ni	0.020	0.017	0.016	0.014	0.010	0.011	0.013	0.015	0.026	0.021	0.018	0.003	0.012	0.017	0.006
Ca	0.011	0.013	0.011	0.018	0.018	0.007	0.003	0.008	0.002	0.005	0.004	0.002	0.002	0.002	0.003
Σ cat	4.785	4.786	4.783	4.782	4.777	4.777	4.769	4.777	4.824	4.824	4.824	4.750	4.750	4.750	4.750
XFe	0.124	0.157	0.137	0.139	0.107	0.106	0.115	0.107	0.098	0.069	0.077	0.116	0.089	0.156	0.168
Fe ⁺³ _{calc}	0.148	0.151	0.054	0.132	0.028	0.112	0.049	0.064	0.166	0.136	0.119	0.203	0.180	0.212	0.233
Fe ⁺³ / Σ Fe	0.43	0.35	0.15	0.35	0.10	0.38	0.16	0.22	0.59	0.69	0.55	0.62	0.73	0.48	0.49

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Table SM1. EMPA analyses of Fe-rich antigorite from *Green Macedonia* meta-ophicarbonate

WDS analyses																					
Σ cat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
m parameter	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Sample	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC
Analyses	85/m	97/m	183/b	187/b	#1	#2	#3	#4	#5	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19
SiO ₂	41.68	40.45	40.78	40.93	42.00	41.48	42.10	41.43	41.60	42.13	41.94	42.78	41.67	41.58	42.03	41.40	41.65	43.27	42.70	42.53	41.84
TiO ₂	0.00	0.03	0.02	0.02	0.03	0.01	0.01	0.00	0.04	0.00	0.01	0.01	0.03	0.01	0.02	0.01	0.00	0.01	0.03	0.01	0.00
Al ₂ O ₃	0.80	1.29	2.86	2.09	0.75	0.58	2.10	0.88	0.78	0.84	0.68	0.96	0.75	0.76	0.78	0.70	0.75	0.87	0.99	0.79	0.86
Cr ₂ O ₃	0.09	0.00	0.28	0.32	0.07	0.06	0.36	0.17	0.06	0.12	0.04	0.06	0.00	0.00	0.04	0.00	0.00	0.04	0.00	0.06	0.05
FeO _{tot}	9.09	11.23	9.50	9.96	9.33	9.16	9.36	9.30	9.52	9.19	8.99	8.81	9.27	8.41	8.32	9.09	9.76	7.74	8.41	8.57	9.10
MnO	0.07	0.10	0.11	0.13	0.05	0.05	0.13	0.07	0.10	0.10	0.06	0.13	0.10	0.05	0.06	0.12	0.08	0.04	0.11	0.06	0.08
MgO	36.10	33.84	33.70	34.75	35.24	35.64	32.83	34.77	35.19	35.04	36.02	35.56	35.13	35.48	35.48	34.93	35.05	35.83	35.57	35.32	35.38
NiO	0.41	0.33	0.32	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CaO	0.22	0.26	0.22	0.37	0.18	0.16	0.45	0.22	0.26	0.17	0.17	0.21	0.26	0.21	0.20	0.32	0.19	0.21	0.25	0.24	0.30
Total	88.46	87.52	87.77	88.83	87.64	87.13	87.34	86.83	87.54	87.58	87.90	88.52	87.20	86.50	86.94	86.58	87.48	88.01	88.05	87.58	87.63
Si	1.903	1.889	1.892	1.874	1.942	1.924	1.972	1.935	1.927	1.951	1.927	1.957	1.936	1.939	1.952	1.937	1.932	1.983	1.960	1.965	1.933
Ti	0.000	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000
Al	0.043	0.071	0.156	0.113	0.041	0.032	0.116	0.048	0.043	0.046	0.037	0.052	0.041	0.042	0.043	0.039	0.041	0.047	0.054	0.043	0.047
Cr	0.003	0.000	0.010	0.012	0.003	0.002	0.013	0.006	0.002	0.004	0.002	0.002	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.002	0.002
Fe _{tot}	0.347	0.438	0.368	0.381	0.361	0.355	0.367	0.363	0.369	0.356	0.345	0.337	0.360	0.328	0.323	0.356	0.379	0.296	0.323	0.331	0.351
Mn	0.003	0.004	0.004	0.005	0.002	0.002	0.005	0.003	0.004	0.004	0.002	0.005	0.004	0.002	0.002	0.005	0.003	0.001	0.004	0.002	0.003
Mg	2.456	2.354	2.328	2.370	2.428	2.462	2.291	2.420	2.428	2.417	2.465	2.423	2.431	2.465	2.454	2.434	2.422	2.446	2.432	2.431	2.435
Ni	0.020	0.017	0.016	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ca	0.011	0.013	0.011	0.018	0.009	0.008	0.022	0.011	0.013	0.008	0.008	0.010	0.013	0.010	0.010	0.016	0.009	0.011	0.012	0.012	0.015
Σ cat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
XFe	0.124	0.157	0.137	0.139	0.129	0.126	0.138	0.130	0.132	0.128	0.123	0.122	0.129	0.117	0.116	0.127	0.135	0.108	0.117	0.120	0.126
Fe ⁺³ calc	0.147	0.151	0.050	0.128	0.072	0.117	-0.073	0.075	0.101	0.048	0.108	0.033	0.087	0.080	0.053	0.087	0.095	-0.014	0.026	0.025	0.085
Fe ⁺³ /ΣFe	0.423	0.346	0.137	0.336	0.199	0.329	-0.199	0.207	0.275	0.135	0.314	0.098	0.241	0.244	0.163	0.246	0.251	-0.048	0.082	0.076	0.243

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4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC	MAC
#20	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30	#31	#32	#33	#34	#35	#36	#37	#38	#39	#40	#41	#42
43.28	42.25	41.99	41.73	41.90	42.19	42.07	41.41	41.46	41.50	41.90	42.00	41.82	41.45	41.60	42.79	42.07	41.66	41.26	41.02	41.23	41.89	41.10
0.00	0.01	0.02	0.01	0.01	0.03	0.02	0.02	0.01	0.04	0.02	0.00	0.02	0.01	0.01	0.03	0.00	0.01	0.03	0.00	0.01	0.00	0.02
1.02	0.78	1.02	0.92	0.84	1.09	0.86	0.95	0.91	0.97	0.76	0.66	0.70	0.63	0.65	0.95	0.73	1.09	0.88	0.84	0.85	0.65	0.80
0.02	0.02	0.01	0.00	0.01	0.04	0.00	0.01	0.01	0.01	0.00	0.07	0.08	0.04	0.05	0.06	0.02	0.03	0.00	0.12	0.00	0.00	0.06
7.54	8.68	9.05	9.40	9.13	9.08	8.45	9.87	9.61	9.52	9.10	8.31	8.38	8.82	9.11	7.97	8.19	8.84	9.72	9.41	8.99	8.66	9.25
0.08	0.05	0.05	0.08	0.05	0.08	0.10	0.06	0.04	0.09	0.05	0.07	0.07	0.05	0.05	0.08	0.00	0.11	0.07	0.10	0.09	0.08	0.12
35.96	35.47	34.88	34.95	35.09	34.74	35.68	34.40	35.00	34.58	35.23	35.92	35.82	35.29	35.58	35.50	35.82	34.76	34.72	34.97	35.42	35.72	34.98
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.25	0.24	0.22	0.24	0.21	0.28	0.20	0.26	0.22	0.26	0.19	0.19	0.16	0.17	0.20	0.22	0.26	0.29	0.21	0.24	0.25	0.18	0.18
88.13	87.50	87.24	87.33	87.22	87.53	87.38	86.98	87.25	86.96	87.25	87.22	87.03	86.46	87.24	87.59	87.09	86.78	86.89	86.71	86.83	87.18	86.50
1.979	1.952	1.951	1.938	1.946	1.956	1.943	1.936	1.927	1.938	1.944	1.941	1.938	1.938	1.928	1.973	1.947	1.944	1.927	1.917	1.918	1.940	1.924
0.000	0.000	0.001	0.000	0.000	0.001	0.001	0.001	0.000	0.002	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.001
0.055	0.042	0.056	0.050	0.046	0.060	0.047	0.052	0.050	0.053	0.042	0.036	0.038	0.035	0.035	0.051	0.040	0.060	0.048	0.046	0.046	0.035	0.044
0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.001	0.002	0.002	0.001	0.001	0.000	0.004	0.000	0.000	0.002
0.288	0.335	0.351	0.365	0.355	0.352	0.326	0.386	0.373	0.371	0.353	0.321	0.324	0.345	0.353	0.307	0.317	0.345	0.380	0.368	0.350	0.335	0.362
0.003	0.002	0.002	0.003	0.002	0.003	0.004	0.002	0.002	0.004	0.002	0.003	0.003	0.002	0.002	0.003	0.000	0.004	0.003	0.004	0.003	0.003	0.005
2.449	2.441	2.414	2.417	2.427	2.399	2.455	2.395	2.423	2.405	2.435	2.473	2.472	2.457	2.456	2.438	2.469	2.417	2.416	2.435	2.455	2.464	2.439
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.012	0.012	0.011	0.012	0.010	0.014	0.010	0.013	0.011	0.013	0.010	0.010	0.008	0.008	0.010	0.011	0.013	0.014	0.011	0.012	0.013	0.009	0.009
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.105	0.121	0.127	0.131	0.127	0.128	0.117	0.139	0.134	0.134	0.127	0.115	0.116	0.123	0.126	0.112	0.114	0.125	0.136	0.131	0.125	0.120	0.129
-0.013	0.052	0.042	0.074	0.062	0.027	0.067	0.075	0.096	0.071	0.070	0.079	0.084	0.089	0.107	0.001	0.066	0.051	0.097	0.115	0.117	0.085	0.106
-0.045	0.156	0.120	0.204	0.176	0.077	0.205	0.195	0.258	0.191	0.199	0.246	0.258	0.257	0.304	0.003	0.208	0.147	0.255	0.313	0.333	0.255	0.292

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TEM-EDS analyses																					
4.786 14	4.786 14	Σcat m parameter	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14
MAC #43	MAC #44	Sample Analyses	MAC-m 71	MAC-m 72	MAC-m 73	MAC-m 74	MAC-m 75	MAC-m 76	MAC-m 77	MAC-m 78	MAC-m 79	MAC-m 80	MAC-m 81	MAC-m 82	MAC-m 83	MAC-m 84	MAC-m 85	MAC-m 86	MAC-m 87	MAC-m 88	MAC-m 89
41.13	42.18	SiO ₂	41.87	41.29	41.73	42.63	42.10	41.97	41.13	41.53	42.39	42.19	42.17	42.12	41.90	41.27	41.68	41.86	42.18	41.77	42.24
0.01	0.00	TiO ₂	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.90	0.48	Al ₂ O ₃	0.72	0.77	0.77	0.68	0.78	1.15	0.97	0.89	1.77	0.92	0.83	0.77	1.09	0.89	0.80	0.78	0.88	0.69	0.89
0.06	0.00	Cr ₂ O ₃	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.76	8.52	FeO _{tot}	9.14	10.67	9.80	8.48	8.63	9.20	10.57	9.92	9.00	9.31	9.21	8.47	9.10	9.85	9.09	8.69	8.58	8.97	8.64
0.06	0.12	MnO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.50	33.78	MgO	36.06	35.83	36.01	36.58	36.27	34.43	34.88	35.05	35.34	36.10	35.69	36.23	35.33	34.85	36.10	36.12	36.06	36.17	36.05
-	-	NiO	0.37	0.43	0.42	0.34	0.37	0.30	0.31	0.44	0.35	0.34	0.33	0.36	0.45	0.35	0.41	0.37	0.31	0.31	0.34
0.55	1.67	CaO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86.96	86.76	Total	88.16	89.00	88.72	88.71	88.15	87.06	87.86	87.84	88.85	88.86	88.23	87.95	87.87	87.21	88.08	87.82	88.00	87.91	88.16
1.922	1.978	Si	1.918	1.883	1.904	1.936	1.925	1.957	1.904	1.920	1.932	1.920	1.934	1.930	1.930	1.921	1.910	1.922	1.933	1.917	1.933
0.000	0.000	Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.050	0.027	Al	0.039	0.041	0.041	0.037	0.042	0.063	0.053	0.048	0.095	0.049	0.045	0.042	0.059	0.049	0.043	0.042	0.047	0.037	0.048
0.002	0.000	Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.381	0.334	Fe _{tot}	0.350	0.407	0.374	0.322	0.330	0.359	0.409	0.383	0.343	0.354	0.353	0.324	0.350	0.383	0.348	0.334	0.329	0.344	0.331
0.002	0.005	Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.401	2.359	Mg	2.461	2.434	2.447	2.475	2.471	2.392	2.405	2.413	2.399	2.446	2.438	2.473	2.424	2.416	2.464	2.470	2.462	2.472	2.457
0.000	0.000	Ni	0.018	0.021	0.020	0.017	0.018	0.015	0.015	0.022	0.017	0.017	0.016	0.018	0.022	0.018	0.020	0.018	0.015	0.015	0.016
0.027	0.084	Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	Σcat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.137	0.124	XFe	0.125	0.143	0.132	0.115	0.118	0.130	0.145	0.137	0.125	0.126	0.126	0.116	0.126	0.137	0.124	0.119	0.118	0.122	0.119
0.105	0.018	Fe ⁺³ _{calc}	0.125	0.193	0.152	0.091	0.108	0.022	0.139	0.113	0.041	0.112	0.088	0.099	0.081	0.110	0.137	0.115	0.087	0.129	0.085
0.275	0.055	Fe ⁺³ /ΣFe	0.356	0.474	0.406	0.283	0.326	0.061	0.341	0.294	0.119	0.315	0.248	0.305	0.230	0.287	0.392	0.344	0.264	0.374	0.257

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4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14
MAC-m 90	MAC-m 91	MAC-m 92	MAC-m 93	MAC-m 94	MAC-m 95	MAC-m 96	MAC-m 97	MAC-m 98	MAC-m 99	MAC-m 100	MAC-m 101	MAC-m 102	MAC-m 103	MAC-m 104	MAC-m 105	MAC-m 106	MAC-m 107	MAC-m 108	MAC-m 109	MAC-m 110	MAC-m 111	MAC-m 112
42.07	42.30	42.07	41.13	41.90	40.97	41.17	40.45	41.33	42.59	41.94	41.53	41.29	41.11	41.03	41.00	41.32	42.27	42.36	40.90	41.42	40.92	41.31
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.00	0.89	0.79	0.71	1.11	0.87	0.85	1.29	0.80	0.90	0.84	0.72	0.83	0.70	0.83	0.73	0.63	0.43	0.61	0.25	0.74	0.86	0.88
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.60	8.61	8.64	10.28	9.16	8.63	9.94	11.23	10.06	8.49	9.11	9.56	10.49	9.84	10.18	10.84	10.45	6.73	8.49	9.76	9.26	10.01	10.62
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35.84	36.86	36.45	35.56	35.25	33.66	35.25	33.84	35.15	35.61	35.86	35.44	35.37	35.78	34.93	35.56	35.85	38.12	36.98	36.78	36.21	35.06	35.06
0.32	0.43	0.35	0.34	0.32	0.34	0.40	0.33	0.28	0.34	0.41	0.30	0.31	0.33	0.33	0.28	0.30	0.33	0.33	0.44	0.34	0.37	0.39
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87.83	89.08	88.30	88.02	87.74	84.47	87.60	87.14	87.62	87.92	88.16	87.54	88.28	87.75	87.31	88.40	88.55	87.87	88.77	88.13	87.98	87.22	88.25
1.933	1.911	1.920	1.895	1.934	1.967	1.905	1.896	1.914	1.957	1.923	1.921	1.899	1.895	1.908	1.883	1.892	1.917	1.919	1.871	1.900	1.903	1.904
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.054	0.047	0.042	0.038	0.060	0.049	0.046	0.071	0.043	0.049	0.045	0.039	0.045	0.038	0.046	0.039	0.034	0.023	0.033	0.013	0.040	0.047	0.048
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.330	0.325	0.330	0.396	0.353	0.346	0.384	0.440	0.390	0.326	0.349	0.370	0.403	0.379	0.396	0.416	0.400	0.255	0.321	0.373	0.355	0.389	0.409
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.453	2.482	2.477	2.440	2.423	2.407	2.430	2.362	2.425	2.438	2.449	2.442	2.423	2.457	2.420	2.433	2.445	2.575	2.496	2.507	2.474	2.428	2.407
0.016	0.021	0.017	0.017	0.016	0.017	0.020	0.017	0.014	0.017	0.020	0.015	0.015	0.016	0.017	0.014	0.015	0.016	0.016	0.022	0.017	0.019	0.019
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.119	0.116	0.117	0.140	0.127	0.126	0.137	0.157	0.138	0.118	0.125	0.131	0.143	0.134	0.141	0.146	0.141	0.090	0.114	0.130	0.126	0.138	0.145
0.080	0.130	0.118	0.172	0.072	0.018	0.143	0.137	0.129	0.037	0.109	0.119	0.156	0.171	0.138	0.194	0.182	0.143	0.128	0.244	0.161	0.147	0.145
0.241	0.400	0.359	0.435	0.205	0.051	0.373	0.312	0.330	0.114	0.313	0.323	0.388	0.451	0.349	0.465	0.454	0.561	0.399	0.654	0.452	0.379	0.355

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4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14
MAC-m 113	MAC-m 114	MAC-m 115	MAC-m 116	MAC-m 117	MAC-m 118	MAC-m 119	MAC-m 120	MAC-m 121	MAC-m 122	MAC-m 123	MAC-m 124	MAC-m 125	MAC-m 126	MAC-m 127	MAC-m 128	MAC-m 129	MAC-m 130	MAC-m 131	MAC-m 132	MAC-m 133	MAC-m 134	MAC-m 135
41.13	40.87	40.74	41.58	41.14	41.18	40.31	41.53	41.86	42.34	42.14	42.90	41.52	41.67	41.19	41.62	42.50	41.26	41.99	42.50	42.58	41.79	41.64
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.74	0.82	0.59	0.52	0.85	0.53	0.86	0.55	0.73	0.98	0.62	0.87	0.93	0.97	0.95	0.77	1.29	0.74	0.67	0.76	0.64	0.89	0.71
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.11	9.78	10.72	9.12	10.43	9.48	10.76	9.65	9.74	9.44	8.63	8.90	10.27	9.95	10.17	9.86	9.18	10.80	8.94	8.49	8.37	9.62	9.67
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35.19	35.13	35.55	36.76	35.41	36.36	33.16	35.71	35.65	35.20	36.53	36.01	35.51	35.32	35.14	35.61	34.57	34.83	36.11	36.41	36.52	35.71	35.36
0.40	0.36	0.43	0.36	0.29	0.25	0.37	0.39	0.33	0.38	0.38	0.32	0.31	0.43	0.41	0.33	0.30	0.34	0.38	0.22	0.39	0.46	0.45
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87.58	86.96	88.02	88.33	88.12	87.80	85.46	87.82	88.31	88.34	88.29	88.99	88.55	88.35	87.87	88.19	87.84	87.96	88.08	88.38	88.49	88.46	87.84
1.906	1.904	1.878	1.896	1.895	1.892	1.927	1.914	1.920	1.944	1.923	1.949	1.903	1.914	1.903	1.912	1.965	1.910	1.924	1.938	1.938	1.913	1.921
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.040	0.045	0.032	0.028	0.046	0.029	0.048	0.030	0.040	0.053	0.033	0.046	0.050	0.052	0.052	0.041	0.070	0.040	0.036	0.041	0.034	0.048	0.039
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.392	0.381	0.413	0.348	0.402	0.364	0.430	0.372	0.373	0.362	0.329	0.338	0.393	0.382	0.393	0.379	0.355	0.418	0.342	0.324	0.318	0.368	0.373
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.429	2.438	2.441	2.497	2.429	2.489	2.362	2.451	2.436	2.408	2.483	2.437	2.424	2.417	2.418	2.437	2.381	2.402	2.465	2.473	2.476	2.435	2.430
0.020	0.018	0.021	0.017	0.014	0.012	0.019	0.019	0.016	0.019	0.019	0.016	0.015	0.021	0.020	0.016	0.015	0.017	0.019	0.011	0.019	0.023	0.022
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.139	0.135	0.145	0.122	0.142	0.128	0.154	0.132	0.133	0.131	0.117	0.122	0.140	0.137	0.140	0.135	0.130	0.148	0.122	0.116	0.114	0.131	0.133
0.149	0.147	0.211	0.180	0.165	0.187	0.097	0.142	0.120	0.059	0.121	0.056	0.144	0.120	0.142	0.134	-0.001	0.141	0.116	0.084	0.090	0.126	0.118
0.379	0.385	0.511	0.519	0.410	0.512	0.227	0.383	0.321	0.162	0.369	0.164	0.366	0.314	0.363	0.354	-0.002	0.336	0.338	0.259	0.282	0.343	0.318

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4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14
MAC-m 136	MAC-m 191	MAC-m 192	MAC-m 193	MAC-m 194	MAC-m 195	MAC-m 196	MAC-m 197	MAC-m 198	MAC-m 199	MAC-m 200	MAC-m 201	MAC-m 202	MAC-m 203	MAC-m 204	MAC-m 205	MAC-m 206	MAC-m 207	MAC-m 208	MAC-m 209	MAC-m 210	MAC-b 137	MAC-b 138
42.75	40.55	41.67	42.15	43.61	41.92	42.32	41.97	41.65	42.07	42.64	42.77	43.14	42.66	41.75	41.85	42.20	42.58	42.54	42.01	41.36	40.40	39.62
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.09	0.94	0.76	0.63	1.01	0.97	1.73	0.42	0.60	0.63	0.75	1.14	1.06	0.78	0.89	1.17	1.47	0.90	0.95	0.81	0.73	4.99	4.91
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.56	11.67	9.46	9.03	7.71	9.72	8.59	8.66	10.11	8.85	8.22	8.67	8.66	9.09	9.75	8.99	9.47	8.45	8.53	9.27	11.33	7.47	8.64
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.91	34.06	35.68	36.48	35.86	35.24	34.79	36.83	35.55	36.29	36.15	35.22	35.54	35.79	35.10	35.50	34.20	35.54	35.13	35.70	35.18	34.10	32.98
0.40	0.37	0.42	0.36	0.24	0.29	0.34	0.37	0.40	0.41	0.31	0.33	0.36	0.34	0.31	0.36	0.29	0.28	0.41	0.18	0.45	0.39	0.37
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88.72	87.59	87.99	88.65	88.43	88.14	87.77	88.25	88.31	88.24	88.07	88.11	88.75	88.65	87.80	87.87	87.64	87.75	87.57	87.97	89.04	87.36	86.52
1.959	1.893	1.916	1.918	1.989	1.929	1.953	1.914	1.913	1.923	1.951	1.965	1.967	1.947	1.929	1.926	1.959	1.960	1.966	1.932	1.893	1.864	1.856
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.059	0.052	0.041	0.034	0.054	0.052	0.094	0.023	0.032	0.034	0.040	0.062	0.057	0.042	0.048	0.063	0.080	0.049	0.052	0.044	0.039	0.271	0.271
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.366	0.455	0.364	0.344	0.294	0.374	0.331	0.330	0.388	0.338	0.315	0.333	0.330	0.347	0.377	0.346	0.368	0.325	0.330	0.356	0.434	0.288	0.338
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.383	2.368	2.444	2.473	2.437	2.416	2.391	2.502	2.433	2.471	2.464	2.410	2.414	2.434	2.416	2.433	2.365	2.438	2.418	2.445	2.399	2.343	2.302
0.020	0.018	0.021	0.018	0.012	0.014	0.017	0.018	0.020	0.020	0.015	0.016	0.017	0.016	0.016	0.018	0.014	0.014	0.020	0.009	0.022	0.019	0.018
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.133	0.161	0.130	0.122	0.108	0.134	0.122	0.117	0.138	0.120	0.113	0.121	0.120	0.125	0.135	0.124	0.135	0.118	0.120	0.127	0.153	0.109	0.128
0.024	0.163	0.127	0.130	-0.033	0.089	0.000	0.150	0.141	0.120	0.057	0.008	0.008	0.063	0.093	0.085	0.002	0.030	0.016	0.093	0.175	0.001	0.016
0.065	0.359	0.348	0.379	-0.112	0.239	0.001	0.453	0.364	0.355	0.181	0.025	0.025	0.183	0.248	0.246	0.005	0.093	0.048	0.260	0.404	0.004	0.048

TablesSM1-4

4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14
MAC-b 139	MAC-b 140	MAC-b 141	MAC-b 142	MAC-b 143	MAC-b 144	MAC-b 145	MAC-b 146	MAC-b 147	MAC-b 148	MAC-b 149	MAC-b 150	MAC-b 151	MAC-b 152	MAC-b 153	MAC-b 154	MAC-b 155	MAC-b 156	MAC-b 157	MAC-b 158	MAC-b 159	MAC-b 160	MAC-b 161
40.48	42.20	42.10	42.20	41.09	40.31	40.41	40.61	41.99	41.58	40.43	41.81	42.35	40.39	40.49	39.94	40.54	40.64	42.91	41.94	41.77	42.41	41.44
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.94	2.01	2.14	2.37	3.22	4.84	4.40	4.98	2.53	3.56	4.02	2.14	2.50	4.62	4.86	5.58	3.99	3.19	2.36	2.23	1.78	2.12	2.05
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.40	9.38	9.96	9.18	9.23	8.06	7.60	7.71	9.54	8.18	8.61	9.49	8.71	8.20	8.37	8.02	8.76	9.14	9.16	9.81	9.78	8.76	9.36
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.44	33.29	33.28	32.60	32.51	33.57	34.89	33.89	32.90	33.40	33.31	32.85	32.86	33.11	33.39	33.32	33.16	32.47	33.44	33.05	33.53	33.09	32.05
0.43	0.33	0.32	0.24	0.40	0.29	0.34	0.31	0.41	0.37	0.37	0.39	0.30	0.32	0.35	0.38	0.41	0.30	0.30	0.28	0.23	0.28	0.28
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86.67	87.20	87.80	86.59	86.44	87.07	87.63	87.50	87.37	87.08	86.74	86.67	86.71	86.64	87.45	87.24	86.85	85.73	88.16	87.31	87.09	86.65	85.17
1.880	1.973	1.959	1.990	1.938	1.872	1.855	1.874	1.963	1.937	1.890	1.969	1.990	1.889	1.876	1.851	1.895	1.931	1.985	1.962	1.955	1.994	1.989
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.216	0.110	0.117	0.132	0.179	0.265	0.238	0.270	0.139	0.195	0.221	0.119	0.138	0.254	0.265	0.305	0.220	0.179	0.129	0.123	0.098	0.117	0.116
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.287	0.367	0.387	0.362	0.364	0.313	0.291	0.297	0.373	0.319	0.336	0.374	0.342	0.320	0.324	0.311	0.342	0.363	0.354	0.383	0.383	0.344	0.375
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.382	2.319	2.307	2.290	2.284	2.322	2.385	2.329	2.291	2.317	2.320	2.305	2.300	2.306	2.304	2.300	2.309	2.298	2.304	2.303	2.338	2.317	2.291
0.021	0.017	0.016	0.012	0.020	0.014	0.017	0.015	0.021	0.018	0.019	0.020	0.015	0.016	0.017	0.019	0.020	0.015	0.015	0.014	0.012	0.014	0.014
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.108	0.136	0.144	0.136	0.137	0.119	0.109	0.113	0.140	0.121	0.127	0.139	0.129	0.122	0.123	0.119	0.129	0.136	0.133	0.143	0.141	0.129	0.141
0.025	-0.057	-0.035	-0.112	-0.056	-0.008	0.053	-0.018	-0.065	-0.068	-0.001	-0.057	-0.119	-0.032	-0.016	-0.007	-0.009	-0.041	-0.098	-0.047	-0.008	-0.104	-0.094
0.087	-0.156	-0.090	-0.310	-0.154	-0.026	0.181	-0.061	-0.173	-0.214	-0.004	-0.154	-0.347	-0.099	-0.051	-0.023	-0.028	-0.112	-0.277	-0.122	-0.022	-0.303	-0.251

TablesSM1-4

4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14	4.786 14
MAC-b 162	MAC-b 163	MAC-b 164	MAC-b 165	MAC-b 166	MAC-b 167	MAC-b 168	MAC-b 169	MAC-b 170	MAC-b 171	MAC-b 172	MAC-b 173	MAC-b 175	MAC-b 176	MAC-b 177	MAC-b 178	MAC-b 179	MAC-b 180	MAC-b 181	MAC-b 182	MAC-b 183	MAC-b 184	MAC-b 185
42.43	40.84	41.18	39.70	42.35	40.58	41.96	40.61	40.84	40.53	40.00	41.21	40.36	39.79	41.44	41.03	42.00	41.03	39.91	42.16	40.78	40.41	40.98
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.69	4.06	2.81	4.64	2.33	4.69	3.13	4.76	3.66	4.75	4.45	3.70	1.45	1.99	1.85	1.80	2.50	4.24	4.63	1.97	2.86	3.77	4.71
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.05	8.33	9.58	8.03	9.39	8.09	8.88	8.06	9.22	8.16	8.39	8.89	10.74	11.50	10.25	9.85	9.51	8.48	8.12	9.65	9.50	8.97	7.90
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.86	33.32	33.62	32.84	32.45	33.22	32.99	33.68	33.12	33.30	32.83	33.40	34.52	34.01	33.80	33.88	32.88	34.03	32.93	33.69	33.70	34.57	33.77
0.20	0.36	0.29	0.26	0.25	0.35	0.41	0.40	0.27	0.32	0.39	0.37	0.22	0.40	0.38	0.28	0.30	0.28	0.35	0.34	0.32	0.33	0.36
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88.23	86.91	87.49	85.46	86.76	86.94	87.36	87.51	87.10	87.05	86.06	87.58	87.29	87.69	87.72	86.84	87.18	88.06	85.93	87.81	87.15	88.05	87.72
1.950	1.905	1.915	1.880	1.996	1.891	1.957	1.877	1.907	1.885	1.885	1.912	1.881	1.852	1.927	1.922	1.967	1.886	1.881	1.957	1.902	1.856	1.889
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.092	0.223	0.154	0.259	0.129	0.258	0.172	0.259	0.201	0.260	0.247	0.202	0.079	0.109	0.101	0.099	0.138	0.230	0.257	0.108	0.157	0.204	0.256
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.348	0.325	0.373	0.318	0.370	0.315	0.346	0.311	0.360	0.317	0.330	0.345	0.418	0.447	0.398	0.386	0.372	0.326	0.320	0.375	0.370	0.344	0.304
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.387	2.315	2.329	2.316	2.278	2.305	2.291	2.319	2.304	2.307	2.304	2.308	2.396	2.358	2.341	2.364	2.294	2.331	2.311	2.330	2.341	2.365	2.319
0.010	0.018	0.014	0.013	0.013	0.017	0.020	0.020	0.013	0.016	0.020	0.019	0.011	0.020	0.019	0.014	0.015	0.014	0.018	0.017	0.016	0.016	0.018
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.127	0.123	0.138	0.121	0.140	0.120	0.131	0.118	0.135	0.121	0.125	0.130	0.149	0.160	0.145	0.140	0.140	0.123	0.122	0.139	0.137	0.127	0.116
0.008	-0.033	0.015	-0.019	-0.121	-0.039	-0.085	-0.013	-0.016	-0.031	-0.016	-0.026	0.158	0.187	0.045	0.056	-0.072	-0.002	-0.018	-0.022	0.039	0.084	-0.034
0.023	-0.102	0.040	-0.059	-0.327	-0.124	-0.246	-0.043	-0.045	-0.097	-0.050	-0.077	0.378	0.419	0.114	0.146	-0.194	-0.008	-0.057	-0.058	0.106	0.243	-0.111

4.786 14	4.786 14	4.786 14	4.786 14
MAC-b 186	MAC-b 187	MAC-b 188	MAC-b 189
40.66	40.93	41.42	42.01
-	-	-	-
4.25	2.09	2.04	1.92
-	-	-	-
8.23	9.96	10.05	9.49
-	-	-	-
33.34	34.75	32.29	33.29
0.27	0.28	0.29	0.32
-	-	-	-
86.74	88.00	86.09	87.03
1.898	1.888	1.970	1.968
0.000	0.000	0.000	0.000
0.234	0.113	0.115	0.106
0.000	0.000	0.000	0.000
0.321	0.384	0.400	0.372
0.000	0.000	0.000	0.000
2.319	2.387	2.287	2.324
0.014	0.014	0.015	0.016
0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786
0.122	0.139	0.149	0.138
-0.030	0.111	-0.054	-0.043
-0.095	0.289	-0.135	-0.115

Table SM2. EMPA analyses of Fe-rich antigorite from *Green Tinos* meta-ophicarbonate

WDS analyses																					
Σ cat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
m parameter	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Sample	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN
Analyses	124	127	137	156	#82	#84	#85	#86	#87	#88	#89	#91	#93	#94	#95	#96	#97	#98	#99	#111	#112
SiO ₂	40.53	40.08	41.26	40.53	39.21	41.50	39.68	40.26	40.84	38.90	41.09	38.52	41.52	40.47	40.44	41.38	42.17	41.67	41.19	43.39	42.26
TiO ₂	0.02	0.02	0.00	0.02	0.01	0.06	0.06	0.05	0.06	0.04	0.02	0.03	0.02	0.03	0.03	0.05	0.05	0.04	0.01	0.01	0.01
Al ₂ O ₃	1.97	1.86	2.02	2.08	2.24	2.14	2.25	2.14	2.62	1.84	2.29	2.32	2.32	1.77	2.26	2.25	2.22	1.95	2.37	0.83	0.83
Cr ₂ O ₃	0.35	0.36	0.68	0.38	0.45	0.27	0.33	0.35	0.38	0.35	0.40	0.41	0.31	0.23	0.38	0.32	0.32	0.27	0.35	0.12	0.15
FeO _{tot}	7.29	7.46	8.05	7.44	7.61	7.54	6.94	7.70	7.48	6.80	7.02	6.84	7.50	7.30	7.01	7.24	7.23	7.50	7.17	7.36	7.04
MnO	0.06	0.00	0.05	0.03	0.05	0.05	0.02	0.03	0.00	0.00	0.03	0.03	0.00	0.06	0.04	0.03	0.02	0.06	0.01	0.00	0.04
MgO	34.04	35.11	34.75	34.67	34.86	35.88	34.35	34.38	35.22	32.90	34.37	34.02	35.18	34.66	34.38	35.25	35.78	35.79	35.24	35.69	34.68
NiO	0.20	0.23	0.26	0.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CaO	0.35	0.14	0.07	0.17	0.12	0.06	0.11	0.13	0.10	0.21	0.10	0.11	0.08	0.08	0.07	0.09	0.07	0.08	0.08	0.16	0.12
Total	84.81	85.25	87.15	85.62	84.55	87.49	83.73	85.04	86.69	81.03	85.31	82.28	86.92	84.58	84.61	86.62	87.85	87.36	86.41	87.56	85.13
Si	1.929	1.890	1.916	1.908	1.864	1.907	1.904	1.909	1.896	1.933	1.941	1.879	1.924	1.925	1.924	1.923	1.931	1.919	1.917	1.998	2.001
Ti	0.001	0.001	0.000	0.001	0.000	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.000	0.000	0.000
Al	0.110	0.104	0.110	0.115	0.125	0.116	0.127	0.120	0.144	0.108	0.127	0.133	0.126	0.099	0.127	0.123	0.120	0.106	0.130	0.045	0.046
Cr	0.013	0.014	0.025	0.014	0.017	0.010	0.012	0.013	0.014	0.014	0.015	0.016	0.011	0.008	0.014	0.012	0.011	0.010	0.013	0.004	0.006
Fe _{tot}	0.290	0.294	0.313	0.293	0.302	0.290	0.279	0.305	0.290	0.282	0.277	0.279	0.291	0.290	0.279	0.281	0.277	0.289	0.279	0.283	0.279
Mn	0.002	0.000	0.002	0.001	0.002	0.002	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.002	0.001	0.001	0.001	0.002	0.000	0.000	0.002
Mg	2.413	2.466	2.404	2.430	2.469	2.456	2.455	2.429	2.436	2.436	2.419	2.471	2.429	2.456	2.436	2.440	2.441	2.455	2.443	2.447	2.446
Ni	0.010	0.011	0.013	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ca	0.018	0.007	0.003	0.008	0.006	0.003	0.005	0.007	0.005	0.011	0.005	0.006	0.004	0.004	0.004	0.005	0.003	0.004	0.004	0.008	0.006
Σ cat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
XFe	0.107	0.106	0.115	0.107	0.109	0.106	0.102	0.112	0.106	0.104	0.103	0.101	0.107	0.106	0.103	0.103	0.102	0.105	0.102	0.104	0.102
Fe ⁺³ _{calc}	0.019	0.103	0.033	0.055	0.130	0.060	0.052	0.049	0.051	0.012	-0.025	0.094	0.014	0.042	0.011	0.020	0.006	0.047	0.023	-0.045	-0.054
Fe ⁺³ / Σ Fe	0.067	0.350	0.105	0.188	0.429	0.206	0.186	0.159	0.175	0.043	-0.089	0.337	0.047	0.145	0.040	0.070	0.023	0.162	0.083	-0.159	-0.194

4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN
#113	#115	#121	#122	#123	#124	#125	#126	#127	#128	#130	#131	#132	#133	#134	#135	#136	#137	#140	#147	#147	#152	#156
42.65	41.73	42.17	41.47	42.43	40.53	40.08	41.44	40.08	43.32	40.49	39.65	41.68	42.96	42.08	41.63	42.30	41.26	40.55	40.73	40.73	40.67	40.53
0.00	0.01	0.01	0.00	0.03	0.02	0.03	0.03	0.02	0.00	0.04	0.03	0.02	0.00	0.00	0.01	0.02	0.00	0.03	0.02	0.02	0.06	0.02
1.03	1.76	1.58	1.93	1.61	1.97	2.16	2.05	1.86	1.65	2.66	1.82	1.07	1.07	1.46	1.26	1.63	2.02	1.94	2.11	2.11	1.91	2.08
0.36	0.28	0.70	1.21	0.88	0.35	0.35	0.34	0.36	1.07	0.41	0.70	0.12	0.00	0.20	0.46	0.62	0.68	0.30	0.40	0.40	0.28	0.38
7.20	7.60	7.74	7.85	7.59	7.29	7.23	7.63	7.46	7.56	7.55	7.10	7.67	7.01	8.12	7.34	7.72	8.05	7.16	7.39	7.39	7.33	7.44
0.00	0.02	0.05	0.03	0.03	0.06	0.05	0.03	0.00	0.04	0.02	0.03	0.02	0.10	0.08	0.08	0.03	0.05	0.00	0.00	0.00	0.00	0.03
34.65	34.91	35.08	33.77	34.29	34.04	34.57	35.45	35.11	33.54	34.21	31.61	34.43	35.97	35.06	33.74	35.06	34.75	34.40	34.53	34.53	34.10	34.67
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.19	0.13	0.08	0.33	0.11	0.35	0.13	0.11	0.14	0.16	0.11	0.39	0.07	0.02	0.12	0.14	0.12	0.07	0.19	0.16	0.16	0.15	0.17
86.07	86.44	87.40	86.58	86.97	84.62	84.59	87.08	85.02	87.34	85.48	81.32	85.09	87.13	87.13	84.66	87.50	86.89	84.56	85.32	85.32	84.50	85.31
2.002	1.947	1.951	1.947	1.979	1.933	1.906	1.917	1.894	2.021	1.911	1.980	1.978	1.981	1.952	1.991	1.955	1.921	1.931	1.924	1.924	1.941	1.914
0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.002	0.001
0.057	0.097	0.086	0.107	0.089	0.111	0.121	0.112	0.104	0.091	0.148	0.107	0.060	0.058	0.080	0.071	0.089	0.111	0.109	0.117	0.117	0.107	0.116
0.013	0.010	0.025	0.045	0.033	0.013	0.013	0.012	0.014	0.039	0.015	0.028	0.004	0.000	0.007	0.017	0.023	0.025	0.011	0.015	0.015	0.011	0.014
0.282	0.296	0.299	0.308	0.296	0.291	0.287	0.295	0.295	0.295	0.298	0.296	0.304	0.270	0.315	0.293	0.298	0.313	0.285	0.292	0.292	0.293	0.294
0.000	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.000	0.002	0.001	0.001	0.001	0.004	0.003	0.003	0.001	0.002	0.000	0.000	0.000	0.000	0.001
2.422	2.427	2.418	2.362	2.383	2.418	2.449	2.442	2.472	2.331	2.406	2.352	2.434	2.471	2.422	2.403	2.414	2.410	2.440	2.430	2.430	2.424	2.438
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.010	0.007	0.004	0.017	0.005	0.018	0.007	0.005	0.007	0.008	0.005	0.021	0.004	0.001	0.006	0.007	0.006	0.003	0.010	0.008	0.008	0.008	0.008
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.104	0.109	0.110	0.115	0.110	0.107	0.105	0.108	0.106	0.112	0.110	0.112	0.111	0.099	0.115	0.109	0.110	0.115	0.105	0.107	0.107	0.108	0.107
-0.073	-0.002	-0.013	-0.046	-0.079	0.011	0.054	0.042	0.094	-0.172	0.014	-0.095	-0.020	-0.021	0.009	-0.069	-0.021	0.022	0.018	0.020	0.020	0.000	0.042
-0.259	-0.006	-0.045	-0.149	-0.267	0.038	0.188	0.142	0.318	-0.583	0.048	-0.321	-0.067	-0.077	0.027	-0.236	-0.072	0.070	0.065	0.068	0.068	0.000	0.144

TEM-EDS analyses																					
Σcat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
m parameter	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Sample	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN
Analyses	2	4	5	6	7	9	10	12	13	14	15	16	17	18	19	20	21	22	23	24	25
SiO ₂	40.26	41.21	42.56	41.42	41.18	39.90	39.84	41.34	39.71	39.77	39.85	39.86	40.34	40.34	39.95	40.15	40.44	40.76	41.24	41.09	41.04
TiO ₂	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Al ₂ O ₃	1.53	2.00	2.30	1.80	1.98	2.54	2.28	2.12	2.28	2.13	2.31	2.46	2.38	2.64	2.42	2.14	2.24	2.28	2.47	2.33	2.67
Cr ₂ O ₃	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FeO _{tot}	7.64	7.08	7.11	7.29	6.99	6.98	7.27	7.86	7.20	7.40	7.19	7.60	7.07	7.26	7.32	7.37	7.26	6.82	6.66	7.48	7.06
MnO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MgO	34.45	34.96	33.82	35.23	35.36	33.80	34.14	35.20	33.32	33.91	34.13	33.37	33.73	34.30	33.93	34.30	34.32	34.09	32.98	34.04	33.79
NiO	0.30	0.14	0.23	0.22	0.24	0.19	0.26	0.27	0.21	0.20	0.18	0.24	0.20	0.14	0.20	0.21	0.19	0.21	0.09	0.21	0.20
CaO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	84.18	85.39	86.03	85.95	85.74	83.41	83.79	86.80	82.71	83.40	83.66	83.52	83.73	84.67	83.82	84.17	84.45	84.17	83.44	85.15	84.76
Si	1.925	1.939	2.000	1.937	1.927	1.923	1.912	1.919	1.934	1.919	1.915	1.926	1.940	1.916	1.918	1.919	1.927	1.948	1.995	1.947	1.952
Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.086	0.111	0.128	0.099	0.109	0.144	0.129	0.116	0.131	0.121	0.131	0.140	0.135	0.148	0.137	0.120	0.126	0.128	0.141	0.130	0.150
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe _{tot}	0.306	0.279	0.279	0.285	0.274	0.281	0.292	0.305	0.293	0.298	0.289	0.307	0.284	0.288	0.294	0.295	0.289	0.273	0.269	0.296	0.281
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mg	2.454	2.450	2.368	2.454	2.465	2.427	2.441	2.433	2.418	2.437	2.443	2.401	2.416	2.427	2.427	2.442	2.435	2.427	2.376	2.403	2.394
Ni	0.015	0.007	0.012	0.011	0.012	0.010	0.013	0.014	0.011	0.010	0.009	0.012	0.010	0.007	0.010	0.011	0.010	0.011	0.005	0.010	0.010
Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Σcat	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
XFe	0.111	0.102	0.106	0.104	0.100	0.104	0.107	0.111	0.108	0.109	0.106	0.113	0.105	0.106	0.108	0.108	0.106	0.101	0.102	0.110	0.105
Fe ⁺³ calc	0.063	0.011	-0.127	0.027	0.037	0.009	0.048	0.047	0.002	0.041	0.040	0.008	-0.015	0.020	0.027	0.043	0.021	-0.024	-0.130	-0.023	-0.054
Fe ⁺³ /ΣFe	0.207	0.039	-0.455	0.094	0.136	0.031	0.163	0.154	0.006	0.138	0.139	0.027	-0.053	0.070	0.091	0.145	0.073	-0.087	-0.484	-0.079	-0.191

4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN
26	27	28	29	30	31	32	33	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
41.10	40.28	39.91	40.97	40.27	39.86	41.37	40.15	40.19	39.66	40.10	40.45	39.99	39.89	39.93	40.90	40.39	41.21	41.22	41.07	40.30	41.33	40.24
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2.12	2.18	2.02	2.26	1.56	2.03	0.99	2.47	1.90	1.64	2.23	2.67	2.50	2.51	2.42	2.70	2.10	2.59	2.49	2.72	2.52	2.34	2.50
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.28	7.24	7.45	7.15	7.89	7.62	7.76	7.16	7.29	7.58	7.19	7.35	7.22	7.31	7.55	7.09	7.45	7.10	7.03	7.31	7.38	7.63	7.13
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.53	34.05	34.23	33.74	33.47	33.99	35.19	33.78	33.89	33.33	34.57	33.92	33.61	33.83	34.06	32.99	34.60	33.75	33.87	33.88	33.78	34.07	33.70
0.21	0.23	0.27	0.29	0.21	0.26	0.30	0.16	0.13	0.17	0.21	0.18	0.19	0.23	0.14	0.11	0.17	0.17	0.18	0.11	0.29	0.22	0.28
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
85.23	83.98	83.88	84.40	83.41	83.76	85.61	83.72	83.39	82.38	84.29	84.58	83.50	83.77	84.10	83.79	84.70	84.81	84.80	85.08	84.27	85.59	83.86
1.941	1.931	1.914	1.957	1.951	1.917	1.946	1.931	1.940	1.942	1.910	1.927	1.929	1.917	1.912	1.972	1.917	1.960	1.960	1.947	1.927	1.949	1.933
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.118	0.123	0.114	0.127	0.089	0.115	0.055	0.140	0.108	0.094	0.125	0.150	0.142	0.142	0.137	0.154	0.117	0.145	0.139	0.152	0.142	0.130	0.142
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.287	0.290	0.299	0.285	0.320	0.306	0.305	0.288	0.294	0.310	0.286	0.293	0.291	0.294	0.302	0.286	0.296	0.282	0.279	0.290	0.295	0.301	0.286
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.429	2.431	2.445	2.401	2.415	2.434	2.465	2.420	2.437	2.431	2.454	2.407	2.414	2.422	2.428	2.369	2.447	2.391	2.398	2.392	2.407	2.394	2.411
0.011	0.012	0.014	0.015	0.011	0.013	0.015	0.008	0.007	0.009	0.011	0.009	0.010	0.012	0.007	0.005	0.009	0.009	0.009	0.005	0.015	0.011	0.014
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.106	0.107	0.109	0.106	0.117	0.112	0.110	0.106	0.108	0.113	0.104	0.108	0.108	0.108	0.111	0.108	0.108	0.106	0.104	0.108	0.109	0.112	0.106
0.000	0.016	0.057	-0.042	0.009	0.051	0.054	-0.001	0.012	0.022	0.054	-0.004	0.001	0.025	0.040	-0.097	0.048	-0.064	-0.059	-0.046	0.003	-0.029	-0.007
0.000	0.054	0.192	-0.147	0.028	0.167	0.177	-0.004	0.040	0.072	0.189	-0.014	0.003	0.084	0.133	-0.340	0.162	-0.228	-0.211	-0.158	0.011	-0.097	-0.026

4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
14	14	14	14	14	14	14	14	14	14	14	14	14	14
TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN	TIN
50	51	52	53	54	55	57	58	59	60	61	62	63	65
40.26	40.89	40.24	39.98	40.55	40.44	40.76	40.33	41.00	40.97	40.52	41.33	40.50	39.80
-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.96	1.73	2.42	2.41	2.57	2.65	2.11	2.38	2.52	2.36	2.15	2.25	2.60	2.12
-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.58	7.57	7.25	7.34	7.23	7.20	7.59	7.48	7.41	7.18	7.41	7.40	7.62	7.82
-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.50	35.27	33.13	33.38	33.94	33.81	34.48	34.18	34.24	33.81	34.03	34.64	34.24	34.91
0.11	0.19	0.16	0.15	0.26	0.17	0.16	0.21	0.19	0.19	0.23	0.28	0.28	0.17
-	-	-	-	-	-	-	-	-	-	-	-	-	-
84.40	85.64	83.19	83.26	84.55	84.27	85.09	84.59	85.35	84.51	84.34	85.89	85.24	84.82
1.919	1.919	1.952	1.936	1.932	1.933	1.929	1.920	1.936	1.955	1.936	1.938	1.915	1.886
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.110	0.095	0.138	0.137	0.144	0.149	0.118	0.134	0.140	0.133	0.121	0.124	0.145	0.118
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.302	0.297	0.294	0.297	0.288	0.288	0.300	0.298	0.292	0.286	0.296	0.290	0.301	0.310
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.449	2.466	2.394	2.408	2.409	2.407	2.431	2.424	2.408	2.403	2.421	2.420	2.411	2.464
0.005	0.010	0.008	0.008	0.013	0.009	0.008	0.011	0.010	0.010	0.012	0.014	0.014	0.008
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786	4.786
0.110	0.107	0.109	0.110	0.107	0.107	0.110	0.109	0.108	0.106	0.109	0.107	0.111	0.112
0.052	0.067	-0.042	-0.009	-0.008	-0.015	0.024	0.026	-0.012	-0.042	0.008	0.000	0.026	0.110
0.172	0.227	-0.142	-0.030	-0.027	-0.052	0.080	0.088	-0.040	-0.147	0.025	-0.001	0.085	0.355

Table SM3. EMPA analyses of Fe-rich antigorite from *Green Verias* meta-ophicarbonate

WDS analyses																					
Σ cat	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	
m paramet	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	
Sample	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	
Analyses	47	78	55	#41	#42	#43	#44	#45	#46	#47	#48	#49	#50	#51	#52	#53	#54	#55	#56	#57	#59
SiO ₂	41.30	41.15	42.26	40.87	43.72	42.04	42.02	41.57	41.84	41.30	42.29	42.35	41.79	41.81	42.08	42.05	42.07	42.47	43.60	42.59	43.08
TiO ₂	0.00	0.02	0.01	0.02	0.00	0.00	0.04	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.03	0.04	0.03	0.00
Al ₂ O ₃	0.20	0.38	0.28	0.27	0.57	0.30	0.35	0.23	0.30	0.20	0.39	0.27	0.59	0.60	0.47	0.37	0.36	0.54	0.79	0.69	0.43
Cr ₂ O ₃	0.03	0.04	0.02	0.00	0.00	0.02	0.10	0.00	0.07	0.03	0.07	0.05	0.02	0.02	0.00	0.00	0.02	0.07	0.03	0.00	0.01
FeO _{tot}	7.30	5.04	5.71	7.45	4.86	6.07	6.09	6.48	6.21	7.30	5.70	5.80	6.06	5.90	6.02	5.92	5.72	5.73	4.28	4.93	4.55
MnO	0.07	0.05	0.07	0.06	0.06	0.06	0.05	0.06	0.07	0.07	0.07	0.10	0.06	0.07	0.06	0.09	0.08	0.05	0.10	0.09	0.06
MgO	37.55	38.20	38.65	37.67	37.71	38.29	37.84	38.53	38.27	37.55	37.88	38.24	37.86	37.79	37.97	38.02	37.88	37.38	38.06	38.13	38.52
NiO	0.52	0.41	0.37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CaO	0.03	0.10	0.08	0.07	0.13	0.06	0.08	0.06	0.06	0.03	0.07	0.06	0.06	0.05	0.06	0.05	0.07	0.06	0.15	0.14	0.10
Total	87.00	85.39	87.45	86.41	87.06	86.85	86.55	86.98	86.83	86.48	86.46	86.87	86.44	86.25	86.67	86.51	86.22	86.32	87.04	86.60	86.73
Si	1.911	1.921	1.932	1.902	2.012	1.938	1.947	1.913	1.930	1.922	1.959	1.952	1.937	1.942	1.946	1.947	1.954	1.974	2.001	1.965	1.981
Ti	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.000
Al	0.011	0.021	0.015	0.015	0.031	0.016	0.019	0.013	0.016	0.011	0.021	0.015	0.032	0.033	0.025	0.020	0.020	0.030	0.043	0.038	0.023
Cr	0.001	0.002	0.001	0.000	0.000	0.001	0.003	0.000	0.003	0.001	0.003	0.002	0.001	0.001	0.000	0.000	0.001	0.003	0.001	0.000	0.000
Fe _{tot}	0.282	0.197	0.218	0.290	0.187	0.234	0.236	0.249	0.240	0.284	0.221	0.223	0.235	0.229	0.232	0.229	0.222	0.223	0.164	0.190	0.175
Mn	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.004	0.002	0.003	0.002	0.004	0.003	0.002	0.004	0.004	0.002
Mg	2.588	2.656	2.633	2.611	2.585	2.629	2.612	2.642	2.630	2.602	2.614	2.625	2.614	2.614	2.615	2.622	2.620	2.589	2.603	2.620	2.638
Ni	0.026	0.021	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ca	0.002	0.005	0.004	0.003	0.006	0.003	0.004	0.003	0.003	0.002	0.004	0.003	0.003	0.002	0.003	0.002	0.004	0.003	0.007	0.007	0.005
Σ cat	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
XFe	0.098	0.069	0.077	0.100	0.067	0.082	0.083	0.086	0.083	0.098	0.078	0.078	0.082	0.081	0.082	0.080	0.078	0.079	0.059	0.068	0.062
Fe ⁺³ calc	0.166	0.136	0.119	0.182	-0.055	0.107	0.083	0.160	0.121	0.145	0.058	0.080	0.093	0.083	0.083	0.086	0.072	0.019	-0.046	0.033	0.015
Fe ⁺³ /ΣFe	0.586	0.693	0.548	0.627	-0.295	0.457	0.353	0.644	0.505	0.510	0.263	0.359	0.395	0.362	0.358	0.376	0.324	0.084	-0.280	0.173	0.088

4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER
#60	#61	#62	#63	#64	#65	#66	#67	#68	#70	#71	#72	#73	#74	#75	#76	#77	#78	#79	#80	#82	#84	#86
43.13	43.43	42.96	42.87	42.75	43.03	43.48	43.69	43.24	41.02	41.11	40.41	41.47	41.91	42.20	41.05	41.42	41.15	41.46	41.21	42.05	42.75	42.47
0.02	0.04	0.01	0.04	0.06	0.01	0.03	0.00	0.03	0.03	0.01	0.01	0.02	0.02	0.00	0.02	0.00	0.02	0.00	0.01	0.02	0.01	0.00
0.47	0.63	0.46	0.43	0.48	0.42	0.42	0.51	0.48	0.33	0.32	0.27	0.53	0.35	0.44	0.40	0.30	0.38	0.37	0.34	0.30	0.39	1.15
0.00	0.05	0.01	0.00	0.03	0.01	0.01	0.05	0.01	0.04	0.03	0.07	0.04	0.03	0.11	0.00	0.07	0.04	0.05	0.02	0.05	0.03	0.09
4.42	3.89	4.72	4.99	4.82	4.35	3.71	3.58	4.08	5.15	4.93	5.78	4.68	4.28	4.19	4.87	4.75	5.04	4.93	4.93	5.66	5.05	4.99
0.08	0.05	0.13	0.14	0.09	0.07	0.08	0.08	0.07	0.08	0.05	0.02	0.05	0.08	0.06	0.03	0.05	0.05	0.01	0.10	0.03	0.05	0.07
38.21	38.48	38.08	37.97	38.08	38.38	38.93	38.80	38.48	38.16	38.37	38.01	38.11	38.28	38.39	38.06	38.56	38.20	38.21	38.03	38.11	38.37	36.84
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.10	0.14	0.11	0.12	0.12	0.09	0.09	0.12	0.09	0.13	0.10	0.06	0.12	0.07	0.07	0.07	0.07	0.10	0.13	0.06	0.08	0.10	0.15
86.44	86.71	86.47	86.55	86.44	86.36	86.75	86.83	86.47	84.94	84.92	84.61	85.01	85.01	85.46	84.51	85.22	84.98	85.15	84.70	86.30	86.74	85.75
1.991	1.995	1.985	1.981	1.976	1.986	1.992	2.001	1.992	1.924	1.926	1.905	1.943	1.961	1.965	1.934	1.933	1.929	1.939	1.939	1.949	1.968	1.986
0.001	0.001	0.000	0.001	0.002	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.000	0.001	0.000	0.000
0.026	0.034	0.025	0.023	0.026	0.023	0.023	0.028	0.026	0.018	0.018	0.015	0.029	0.019	0.024	0.022	0.017	0.021	0.021	0.019	0.016	0.021	0.064
0.000	0.002	0.000	0.000	0.001	0.000	0.000	0.002	0.000	0.002	0.001	0.003	0.001	0.001	0.004	0.000	0.003	0.002	0.002	0.001	0.002	0.001	0.003
0.171	0.149	0.182	0.193	0.186	0.168	0.142	0.137	0.157	0.202	0.193	0.228	0.183	0.167	0.163	0.192	0.185	0.198	0.193	0.194	0.219	0.194	0.195
0.003	0.002	0.005	0.005	0.004	0.003	0.003	0.003	0.003	0.003	0.002	0.001	0.002	0.003	0.002	0.001	0.002	0.002	0.000	0.004	0.001	0.002	0.003
2.628	2.633	2.621	2.614	2.623	2.639	2.658	2.647	2.641	2.667	2.678	2.670	2.659	2.668	2.662	2.671	2.681	2.667	2.663	2.665	2.632	2.632	2.566
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.005	0.007	0.005	0.006	0.006	0.004	0.004	0.006	0.004	0.006	0.005	0.003	0.006	0.004	0.003	0.004	0.004	0.005	0.006	0.003	0.004	0.005	0.008
4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
0.061	0.054	0.065	0.069	0.066	0.060	0.051	0.049	0.056	0.070	0.067	0.079	0.064	0.059	0.058	0.067	0.065	0.069	0.068	0.068	0.077	0.069	0.071
-0.008	-0.026	0.005	0.014	0.020	0.004	-0.008	-0.031	-0.011	0.131	0.129	0.172	0.084	0.058	0.042	0.110	0.114	0.120	0.099	0.103	0.083	0.041	-0.038
-0.046	-0.177	0.025	0.073	0.109	0.026	-0.057	-0.229	-0.068	0.649	0.666	0.754	0.461	0.344	0.259	0.575	0.617	0.607	0.513	0.533	0.380	0.212	-0.197

4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER
#45	#46	#47	#48	#49	#50	#51	#52	#53	#54	#55	#56	#57	#58	#59	#60	#61	#62	#63	#64	#65	#66	#67
42.26	42.43	42.41	44.68	42.28	41.96	42.65	42.37	42.28	43.71	42.26	42.84	42.75	42.28	42.32	42.44	43.10	42.23	43.89	43.23	44.13	43.15	42.71
0.03	0.03	0.01	0.01	0.04	0.00	0.00	0.02	0.00	0.03	0.01	0.05	0.00	0.01	0.01	0.01	0.00	0.02	0.00	0.00	0.01	0.01	0.00
0.25	0.22	0.27	0.74	0.27	0.22	0.29	0.39	0.24	0.45	0.28	0.26	0.31	0.30	0.29	0.29	0.48	0.35	0.59	0.57	0.45	0.45	0.31
0.05	0.04	0.05	0.02	0.05	0.00	0.05	0.04	0.01	0.02	0.02	0.02	0.04	0.05	0.00	0.00	0.07	0.05	0.10	0.04	0.00	0.03	0.00
5.81	5.86	5.64	3.87	5.89	6.11	5.57	5.70	6.11	4.48	5.71	5.24	5.60	5.65	5.79	5.20	4.95	6.43	4.31	4.89	4.02	4.87	5.46
0.06	0.01	0.08	0.11	0.09	0.06	0.00	0.07	0.05	0.11	0.07	0.06	0.07	0.08	0.10	0.05	0.24	0.05	0.15	0.07	0.04	0.06	0.11
38.34	38.60	38.35	38.66	38.36	38.18	38.49	37.98	38.16	39.25	38.65	38.67	38.50	38.13	38.17	38.24	38.56	38.04	38.55	38.05	39.09	38.18	38.69
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.09	0.04	0.16	0.18	0.05	0.12	0.07	0.08	0.06	0.09	0.08	0.08	0.08	0.09	0.09	0.05	0.14	0.08	0.15	0.15	0.11	0.10	0.11
86.88	87.22	86.97	88.28	87.02	86.65	87.12	86.65	86.92	88.13	87.07	87.22	87.34	86.59	86.78	86.27	87.55	87.24	87.73	87.00	87.84	86.85	87.39
1.947	1.946	1.951	2.020	1.945	1.939	1.958	1.958	1.949	1.977	1.940	1.962	1.958	1.954	1.952	1.965	1.968	1.943	1.998	1.988	2.001	1.986	1.953
0.001	0.001	0.000	0.000	0.001	0.000	0.000	0.001	0.000	0.001	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000
0.013	0.012	0.015	0.040	0.014	0.012	0.016	0.021	0.013	0.024	0.015	0.014	0.017	0.016	0.016	0.016	0.026	0.019	0.032	0.031	0.024	0.024	0.017
0.002	0.001	0.002	0.001	0.002	0.000	0.002	0.001	0.000	0.001	0.001	0.001	0.001	0.002	0.000	0.000	0.002	0.002	0.004	0.001	0.000	0.001	0.000
0.224	0.225	0.217	0.146	0.226	0.236	0.214	0.220	0.235	0.169	0.219	0.201	0.214	0.218	0.223	0.201	0.189	0.247	0.164	0.188	0.152	0.187	0.209
0.002	0.000	0.003	0.004	0.003	0.002	0.000	0.003	0.002	0.004	0.003	0.002	0.003	0.003	0.004	0.002	0.009	0.002	0.006	0.003	0.001	0.002	0.004
2.630	2.637	2.628	2.604	2.629	2.628	2.632	2.615	2.621	2.644	2.643	2.639	2.627	2.625	2.623	2.637	2.622	2.607	2.614	2.606	2.640	2.618	2.636
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.005	0.002	0.008	0.009	0.002	0.006	0.003	0.004	0.003	0.004	0.004	0.004	0.004	0.004	0.005	0.002	0.007	0.004	0.007	0.008	0.005	0.005	0.005
4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
0.078	0.079	0.076	0.053	0.079	0.082	0.075	0.078	0.082	0.060	0.077	0.071	0.075	0.077	0.078	0.071	0.067	0.087	0.059	0.067	0.055	0.067	0.073
0.091	0.095	0.081	-0.081	0.093	0.109	0.067	0.060	0.088	0.022	0.105	0.061	0.065	0.073	0.080	0.054	0.036	0.093	-0.031	-0.008	-0.025	0.003	0.077
0.408	0.423	0.374	-0.553	0.411	0.463	0.315	0.274	0.374	0.129	0.478	0.302	0.305	0.335	0.356	0.267	0.191	0.378	-0.189	-0.042	-0.164	0.017	0.368

																TEM-EDS analyses						
4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	Σcat	4.824 m paramet	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17
VER #68	VER #69	VER #70	VER #71	VER #73	VER #74	VER #75	VER #77	VER #78	VER #79	VER #80	VER #81	VER #82	VER #83	VER #84	VER #85	Sample Analyses	VER 1	VER 3	VER 5	VER 8	VER 5	
42.48	43.31	44.03	44.08	42.90	44.51	42.74	44.34	42.32	44.34	43.86	43.03	44.61	43.06	42.58	44.75	SiO ₂	42.97	42.61	43.10	45.43	43.10	
0.00	0.04	0.02	0.00	0.02	0.01	0.00	0.01	0.01	0.00	0.02	0.00	0.02	0.03	0.03	0.02	TiO ₂	-	-	-	-	-	
0.44	0.50	0.36	0.52	0.43	0.73	0.44	0.21	0.39	0.34	0.59	0.36	0.31	0.45	0.33	0.40	Al ₂ O ₃	0.43	0.23	0.28	0.49	0.28	
0.03	0.05	0.06	0.00	0.03	0.00	0.03	0.00	0.04	0.00	0.03	0.02	0.01	0.05	0.04	0.02	Cr ₂ O ₃	-	-	-	-	-	
5.25	5.15	4.38	4.26	5.12	3.74	5.41	4.94	4.30	4.75	4.40	5.05	4.65	5.13	5.36	3.19	FeO _{tot}	4.50	5.99	5.68	4.35	5.68	
0.59	0.07	0.08	0.15	0.09	0.13	0.07	0.13	0.11	0.09	0.05	0.08	0.15	0.12	0.09	0.13	MnO	-	-	-	-	-	
37.84	38.24	38.00	38.94	38.24	38.78	37.98	38.22	36.74	38.17	38.39	38.42	38.41	38.45	38.68	39.90	MgO	36.45	38.53	38.50	38.90	38.50	
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NiO	0.41	0.42	0.52	0.37	0.52	
0.15	0.14	0.93	0.16	0.09	0.13	0.11	0.24	2.57	0.21	0.16	0.14	0.08	0.14	0.09	0.08	CaO	-	-	-	-	-	
86.78	87.49	87.86	88.10	86.90	88.03	86.77	88.09	86.48	87.91	87.49	87.09	88.24	87.44	87.19	88.48	Total	84.76	87.78	88.08	89.53	88.08	
1.962	1.981	2.007	1.996	1.974	2.016	1.972	2.018	1.963	2.020	2.003	1.974	2.024	1.970	1.951	2.007	Si	2.033	1.944	1.960	2.030	1.960	
0.000	0.001	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	Ti	0.000	0.000	0.000	0.000	0.000	
0.024	0.027	0.019	0.028	0.023	0.039	0.024	0.011	0.021	0.018	0.032	0.019	0.017	0.024	0.018	0.021	Al	0.024	0.012	0.015	0.026	0.015	
0.001	0.002	0.002	0.000	0.001	0.000	0.001	0.000	0.002	0.000	0.001	0.001	0.000	0.002	0.001	0.001	Cr	0.000	0.000	0.000	0.000	0.000	
0.203	0.197	0.167	0.161	0.197	0.141	0.209	0.188	0.167	0.181	0.168	0.194	0.176	0.196	0.205	0.120	Fe _{tot}	0.178	0.228	0.216	0.163	0.216	
0.023	0.003	0.003	0.006	0.003	0.005	0.003	0.005	0.004	0.004	0.002	0.003	0.006	0.004	0.003	0.005	Mn	0.000	0.000	0.000	0.000	0.000	
2.604	2.606	2.580	2.626	2.621	2.616	2.610	2.591	2.539	2.591	2.611	2.626	2.596	2.619	2.640	2.666	Mg	2.569	2.619	2.608	2.589	2.608	
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Ni	0.021	0.021	0.025	0.017	0.025	
0.007	0.007	0.045	0.008	0.005	0.006	0.005	0.012	0.127	0.010	0.008	0.007	0.004	0.007	0.004	0.004	Ca	0.000	0.000	0.000	0.000	0.000	
4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	Σcat	4.824	4.824	4.824	4.824	4.824	
0.072	0.070	0.061	0.058	0.070	0.051	0.074	0.068	0.062	0.065	0.060	0.069	0.064	0.070	0.072	0.043	XFe	0.065	0.080	0.076	0.059	0.076	
0.051	0.008	-0.035	-0.019	0.028	-0.071	0.031	-0.046	0.051	-0.059	-0.038	0.032	-0.065	0.034	0.079	-0.036	Fe ⁺³ _{calc}	-0.090	0.099	0.065	-0.085	0.065	
0.249	0.043	-0.209	-0.117	0.145	-0.500	0.149	-0.246	0.305	-0.325	-0.227	0.164	-0.371	0.175	0.384	-0.300	Fe ⁺³ /ΣFe	-0.504	0.435	0.302	-0.521	0.302	

4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER	VER
11	12	13	14	16	17	18	20	21	23	24	26	29	30	31	32	33	36	37	38	39	40	41
42.60	45.07	42.94	41.51	42.59	43.89	41.71	42.62	41.95	42.56	42.27	42.84	42.04	41.32	42.52	42.87	41.14	46.21	42.50	41.92	41.19	44.05	42.29
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.32	0.28	0.29	0.52	0.30	0.41	0.22	0.35	1.14	1.11	1.12	0.41	0.47	0.32	0.25	0.24	0.32	0.39	0.57	0.50	0.32	0.30	0.44
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.96	5.26	5.01	5.13	4.71	4.66	6.44	4.55	5.65	5.67	5.86	5.02	4.70	5.64	5.39	6.38	5.13	4.42	4.71	5.11	6.02	6.51	4.49
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38.43	39.98	38.45	35.84	38.21	38.70	37.57	36.17	36.20	36.33	35.88	37.29	36.70	36.56	38.75	39.15	35.86	41.14	36.74	37.18	36.95	40.25	36.10
0.43	0.50	0.44	0.41	0.31	0.35	0.37	0.32	0.36	0.37	0.52	0.55	0.44	0.47	0.43	0.49	0.39	0.42	0.39	0.35	0.45	0.54	0.40
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86.73	91.08	87.14	83.41	86.11	88.00	86.30	84.01	85.31	86.04	85.65	86.11	84.35	84.31	87.34	89.14	82.85	92.58	84.91	85.06	84.92	91.64	83.72
1.960	1.979	1.969	1.998	1.973	1.992	1.940	2.035	1.978	1.991	1.990	1.994	1.995	1.966	1.944	1.927	1.991	1.989	2.005	1.972	1.946	1.925	2.025
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.017	0.014	0.016	0.030	0.016	0.022	0.012	0.020	0.063	0.061	0.062	0.023	0.026	0.018	0.013	0.013	0.018	0.020	0.032	0.028	0.018	0.015	0.025
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.191	0.193	0.192	0.206	0.182	0.177	0.250	0.182	0.223	0.222	0.231	0.195	0.186	0.224	0.206	0.240	0.208	0.159	0.186	0.201	0.238	0.238	0.180
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.634	2.615	2.626	2.569	2.637	2.617	2.603	2.572	2.542	2.532	2.516	2.585	2.594	2.592	2.639	2.621	2.586	2.637	2.582	2.605	2.600	2.620	2.575
0.021	0.023	0.022	0.021	0.016	0.017	0.018	0.016	0.018	0.019	0.026	0.027	0.022	0.024	0.021	0.024	0.020	0.019	0.020	0.018	0.023	0.025	0.020
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824	4.824
0.068	0.069	0.068	0.074	0.065	0.063	0.088	0.066	0.081	0.080	0.084	0.070	0.067	0.080	0.072	0.084	0.074	0.057	0.067	0.072	0.084	0.083	0.065
0.062	0.028	0.047	-0.025	0.038	-0.006	0.107	-0.089	-0.019	-0.043	-0.041	-0.010	-0.016	0.049	0.098	0.133	-0.001	0.003	-0.042	0.028	0.091	0.134	-0.074
0.325	0.145	0.243	-0.123	0.207	-0.032	0.429	-0.489	-0.083	-0.193	-0.177	-0.053	-0.088	0.220	0.478	0.556	-0.006	0.018	-0.225	0.140	0.381	0.564	-0.414

4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17	4.824 17
VER 42	VER 44	VER 51	VER 52	VER 66	VER 67	VER 70
41.64	42.20	41.71	42.06	42.16	42.20	41.62
-	-	-	-	-	-	-
0.27	0.47	0.47	0.38	0.32	0.44	0.35
-	-	-	-	-	-	-
5.70	4.08	5.72	5.87	5.38	5.12	4.61
-	-	-	-	-	-	-
37.14	36.89	36.74	37.17	37.89	37.17	36.84
0.37	0.42	0.49	0.45	0.32	0.50	0.29
-	-	-	-	-	-	-
85.12	84.05	85.14	85.93	86.08	85.42	83.71
1.961	2.004	1.967	1.965	1.959	1.979	1.986
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.015	0.026	0.026	0.021	0.018	0.024	0.020
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.224	0.162	0.225	0.229	0.209	0.201	0.184
0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.605	2.610	2.581	2.587	2.622	2.596	2.619
0.018	0.021	0.025	0.022	0.016	0.025	0.015
0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.824	4.824	4.824	4.824	4.824	4.824	4.824
0.079	0.058	0.080	0.081	0.074	0.072	0.066
0.064	-0.035	0.040	0.050	0.065	0.019	0.008
0.283	-0.216	0.178	0.217	0.309	0.094	0.041

Table SM4. EMPA analyses of Fe-rich antigorite from *Verde Acceglio* meta-ophicarbonate

WDS analyses																					
Σ cat	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
m parameter	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Sample	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
Analyses	71	160	247	250	#128	#129	#130	#131	#132	#133	#134	#135	#136	#137	#138	#139	#140	#141	#142	#143	#144
SiO ₂	40.29	40.60	40.21	39.85	41.56	42.10	41.48	41.84	41.32	41.34	42.32	42.26	40.41	40.38	42.04	41.77	41.07	43.62	43.81	42.45	42.14
TiO ₂	0.03	0.00	0.05	0.00	0.03	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Al ₂ O ₃	1.23	2.20	1.17	1.05	0.27	0.27	0.22	0.23	0.16	0.11	0.42	0.38	0.16	0.12	0.24	0.41	0.20	0.57	0.69	0.50	0.35
Cr ₂ O ₃	0.00	0.00	0.05	0.07	0.00	0.00	0.02	0.00	0.00	0.04	0.03	0.05	0.03	0.00	0.00	0.00	0.05	0.10	0.08	0.08	0.05
FeO _{tot}	8.46	6.47	11.31	12.23	5.82	5.52	5.72	5.21	6.17	5.80	5.01	5.01	6.82	7.21	5.37	5.80	6.93	4.10	3.55	5.11	5.25
MnO	0.03	0.06	0.06	0.02	0.03	0.05	0.06	0.05	0.06	0.08	0.08	0.08	0.06	0.08	0.09	0.07	0.04	0.07	0.05	0.06	0.06
MgO	36.01	37.07	34.27	33.94	38.04	37.97	38.03	37.96	38.10	37.98	38.01	38.01	37.79	37.47	38.57	37.66	37.91	38.49	38.26	38.02	38.16
NiO	0.07	0.24	0.34	0.11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CaO	0.04	0.05	0.05	0.07	0.04	0.06	0.03	0.07	0.05	0.03	0.10	0.07	0.05	0.02	0.05	0.08	0.06	0.11	0.10	0.08	0.08
Total	86.16	86.69	87.50	87.33	85.79	85.98	85.55	85.39	85.86	85.37	85.97	85.86	85.31	85.28	86.37	85.79	86.24	87.05	86.54	86.31	86.08
Si	1.865	1.851	1.861	1.853	1.907	1.928	1.908	1.927	1.896	1.906	1.936	1.936	1.869	1.872	1.913	1.920	1.881	1.968	1.986	1.936	1.926
Ti	0.001	0.000	0.002	0.000	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Al	0.067	0.118	0.064	0.057	0.015	0.015	0.012	0.013	0.009	0.006	0.022	0.021	0.008	0.007	0.013	0.022	0.011	0.030	0.037	0.027	0.019
Cr	0.000	0.000	0.002	0.003	0.000	0.000	0.001	0.000	0.000	0.002	0.001	0.002	0.001	0.000	0.000	0.000	0.002	0.003	0.003	0.003	0.002
Fe _{tot}	0.327	0.247	0.437	0.475	0.223	0.211	0.220	0.201	0.236	0.223	0.192	0.192	0.264	0.279	0.204	0.223	0.265	0.155	0.135	0.195	0.200
Mn	0.001	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.003	0.003	0.003	0.002	0.003	0.002	0.002	0.002
Mg	2.483	2.518	2.362	2.352	2.601	2.591	2.606	2.604	2.604	2.609	2.591	2.593	2.603	2.588	2.614	2.578	2.587	2.586	2.583	2.583	2.597
Ni	0.003	0.012	0.017	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ca	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.002	0.005	0.003	0.002	0.001	0.003	0.004	0.003	0.005	0.005	0.004	0.004
Σ cat	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
XFe	0.116	0.089	0.156	0.168	0.079	0.075	0.078	0.072	0.083	0.079	0.069	0.069	0.092	0.097	0.073	0.080	0.093	0.056	0.050	0.070	0.072
Fe ⁺³ _{calc}	0.203	0.180	0.212	0.233	0.171	0.128	0.172	0.134	0.199	0.180	0.104	0.106	0.253	0.249	0.162	0.138	0.225	0.031	-0.011	0.098	0.128
Fe ⁺³ / Σ Fe	0.619	0.729	0.485	0.491	0.765	0.608	0.780	0.666	0.842	0.807	0.542	0.552	0.960	0.891	0.792	0.619	0.848	0.202	-0.085	0.504	0.638

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
#145	#146	#147	#148	#149	#150	#151	#152	#153	#154	#155	#156	#157	#158	#159	#160	#161	#162	#163	#164	#165	#166	#167
42.74	42.57	42.66	42.25	42.48	43.39	42.10	41.71	42.16	41.64	41.83	42.21	43.20	42.23	41.59	41.76	42.66	43.38	42.82	42.20	42.41	41.98	42.26
0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.05	0.01	0.00	0.00	0.01	0.03	0.03	0.03	0.01	0.02	0.00	0.02	0.00	0.00
0.44	0.42	0.38	0.41	0.48	0.81	0.80	0.42	0.35	0.31	0.30	0.27	0.50	0.39	0.35	0.32	0.56	0.64	0.63	0.61	0.58	0.33	0.49
0.07	0.11	0.06	0.08	0.04	0.23	0.07	0.05	0.03	0.05	0.05	0.07	0.06	0.04	0.03	0.07	0.02	0.02	0.01	0.05	0.02	0.00	0.05
4.87	5.21	4.76	5.30	5.01	4.09	5.15	5.50	5.36	5.88	5.36	5.45	4.37	5.09	5.71	5.81	3.22	3.17	3.59	4.02	4.23	4.28	3.64
0.08	0.03	0.06	0.05	0.11	0.07	0.05	0.09	0.06	0.06	0.00	0.02	0.04	0.04	0.05	0.10	0.08	0.05	0.12	0.08	0.02	0.00	0.12
38.49	38.24	38.27	38.07	37.95	38.28	37.32	37.96	38.15	37.87	38.00	38.41	38.28	38.18	37.89	38.06	38.65	38.53	38.48	37.39	37.82	38.51	38.19
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.09	0.10	0.11	0.09	0.12	0.07	0.11	0.06	0.06	0.05	0.07	0.07	0.07	0.07	0.10	0.06	0.13	0.12	0.12	0.13	0.16	0.06	0.08
86.80	86.71	86.28	86.25	86.18	86.94	85.61	85.78	86.16	85.90	85.62	86.49	86.53	86.04	85.73	86.21	85.35	85.93	85.79	84.47	85.25	85.16	84.82
1.935	1.933	1.943	1.928	1.940	1.961	1.939	1.914	1.925	1.911	1.922	1.920	1.961	1.929	1.911	1.909	1.952	1.974	1.953	1.961	1.952	1.929	1.949
0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.000	0.001	0.000	0.001	0.000	0.000
0.024	0.023	0.020	0.022	0.026	0.043	0.043	0.023	0.019	0.017	0.016	0.014	0.027	0.021	0.019	0.017	0.030	0.035	0.034	0.033	0.032	0.018	0.027
0.003	0.004	0.002	0.003	0.001	0.008	0.003	0.002	0.001	0.002	0.002	0.003	0.002	0.001	0.001	0.003	0.001	0.001	0.000	0.002	0.001	0.000	0.002
0.184	0.198	0.181	0.202	0.191	0.155	0.198	0.211	0.205	0.225	0.206	0.207	0.166	0.195	0.219	0.222	0.123	0.121	0.137	0.156	0.163	0.164	0.140
0.003	0.001	0.002	0.002	0.004	0.003	0.002	0.003	0.002	0.002	0.000	0.001	0.002	0.001	0.002	0.004	0.003	0.002	0.005	0.003	0.001	0.000	0.005
2.596	2.586	2.596	2.588	2.582	2.577	2.560	2.594	2.595	2.589	2.600	2.602	2.589	2.599	2.593	2.592	2.634	2.612	2.615	2.588	2.593	2.636	2.624
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.005	0.005	0.005	0.004	0.006	0.004	0.005	0.003	0.003	0.002	0.004	0.003	0.004	0.003	0.005	0.003	0.006	0.006	0.006	0.006	0.008	0.003	0.004
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.066	0.071	0.065	0.072	0.069	0.057	0.072	0.075	0.073	0.080	0.073	0.074	0.060	0.070	0.078	0.079	0.045	0.044	0.050	0.057	0.059	0.059	0.051
0.103	0.108	0.092	0.118	0.093	0.027	0.077	0.148	0.130	0.160	0.138	0.144	0.049	0.119	0.159	0.162	0.066	0.017	0.059	0.043	0.063	0.124	0.074
0.561	0.547	0.507	0.586	0.486	0.177	0.389	0.699	0.633	0.710	0.671	0.695	0.293	0.611	0.725	0.731	0.532	0.140	0.432	0.272	0.385	0.757	0.524

			TEM-EDS analyses																		
4.750	4.750	4.750	Σcat	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	m parameter	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	Sample	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
#168	#169	#170	Analyses	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
41.94	41.87	41.51	SiO ₂	40.86	40.29	40.95	42.00	41.50	40.91	40.54	40.98	40.75	40.60	40.93	41.30	42.02	41.28	40.87	41.57	41.45	42.62
0.02	0.00	0.01	TiO ₂	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.49	0.44	0.37	Al ₂ O ₃	1.16	1.23	1.20	1.09	1.10	1.39	1.15	1.75	0.79	0.68	1.16	0.94	0.91	1.11	1.19	1.03	1.58	1.47
0.01	0.08	0.00	Cr ₂ O ₃	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4.09	4.19	4.49	FeO _{tot}	8.89	8.46	7.57	6.72	7.38	7.66	8.20	7.76	7.71	8.03	8.26	7.65	6.52	8.12	8.02	7.42	6.90	6.62
0.08	0.02	0.09	MnO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38.02	38.46	38.16	MgO	35.51	36.01	36.54	36.89	36.06	36.43	35.95	34.61	35.94	36.05	36.01	37.47	37.15	36.40	35.81	36.68	36.98	36.12
-	-	-	NiO	0.13	0.07	0.23	0.38	0.13	0.36	0.29	0.29	0.05	0.02	0.34	0.40	0.10	0.22	0.33	0.23	0.17	0.08
0.11	0.12	0.09	CaO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
84.74	85.18	84.72	Total	86.55	86.06	86.49	87.06	86.16	86.75	86.13	85.39	85.24	85.38	86.70	87.76	86.71	87.13	86.22	86.93	87.08	86.91
1.939	1.924	1.919	Si	1.890	1.867	1.882	1.914	1.917	1.875	1.877	1.920	1.903	1.894	1.884	1.868	1.919	1.888	1.891	1.901	1.887	1.951
0.001	0.000	0.000	Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.027	0.024	0.020	Al	0.063	0.067	0.065	0.058	0.060	0.075	0.063	0.097	0.044	0.037	0.063	0.050	0.049	0.060	0.065	0.056	0.085	0.079
0.000	0.003	0.000	Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.158	0.161	0.173	Fe _{tot}	0.344	0.327	0.291	0.256	0.285	0.294	0.317	0.304	0.301	0.313	0.318	0.289	0.249	0.311	0.310	0.283	0.263	0.253
0.003	0.001	0.004	Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.618	2.632	2.629	Mg	2.447	2.485	2.501	2.504	2.482	2.488	2.479	2.415	2.500	2.505	2.469	2.524	2.528	2.481	2.468	2.498	2.507	2.463
0.000	0.000	0.000	Ni	0.006	0.003	0.011	0.018	0.006	0.018	0.014	0.014	0.003	0.001	0.017	0.019	0.005	0.011	0.016	0.011	0.008	0.004
0.005	0.006	0.005	Ca	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	Σcat	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.057	0.058	0.062	XFe	0.123	0.116	0.104	0.093	0.103	0.106	0.113	0.112	0.107	0.111	0.114	0.103	0.090	0.111	0.112	0.102	0.095	0.093
0.096	0.125	0.141	Fe ⁺³ calc	0.157	0.199	0.172	0.114	0.105	0.174	0.184	0.064	0.150	0.175	0.170	0.215	0.112	0.164	0.154	0.142	0.142	0.020
0.606	0.780	0.814	Fe ⁺³ /ΣFe	0.456	0.608	0.590	0.447	0.370	0.593	0.578	0.210	0.499	0.560	0.535	0.744	0.450	0.526	0.495	0.502	0.539	0.077

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
88	89	90	91	92	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124
41.84	41.86	41.12	40.60	41.46	41.72	41.12	41.28	40.28	41.21	40.51	41.45	40.84	41.81	41.19	40.59	41.51	40.83	41.56	41.10	41.28	41.53	41.17
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.89	0.86	1.10	1.56	0.82	1.21	1.18	1.32	1.22	1.36	1.54	1.35	1.13	1.18	1.19	1.30	1.32	1.33	1.12	1.48	1.60	1.74	1.62
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.33	7.18	7.88	8.61	7.71	8.37	8.39	7.77	7.80	8.16	6.74	6.91	7.22	7.45	7.41	7.35	7.21	7.24	6.99	6.92	6.78	6.32	7.23
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37.36	37.29	35.87	35.82	36.02	35.86	36.00	36.15	36.27	36.24	36.40	36.29	35.86	35.80	36.62	36.21	36.04	36.47	37.45	36.77	36.68	37.28	37.09
0.27	0.20	0.19	0.29	0.06	0.17	0.13	0.24	0.17	0.34	0.29	0.26	0.26	0.29	0.20	0.10	0.31	0.29	0.37	0.15	0.25	0.39	0.32
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86.69	87.39	86.15	86.89	86.07	87.32	86.82	86.75	85.73	87.30	85.47	86.26	85.31	86.52	86.61	85.55	86.38	86.16	87.49	86.42	86.57	87.26	87.42
1.909	1.900	1.903	1.867	1.919	1.910	1.891	1.896	1.868	1.883	1.877	1.909	1.904	1.927	1.889	1.885	1.913	1.881	1.882	1.885	1.890	1.882	1.868
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.048	0.046	0.060	0.084	0.045	0.065	0.064	0.071	0.067	0.073	0.084	0.073	0.062	0.064	0.064	0.071	0.071	0.072	0.059	0.080	0.086	0.093	0.086
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.241	0.272	0.305	0.331	0.298	0.320	0.322	0.298	0.302	0.312	0.261	0.266	0.281	0.287	0.284	0.285	0.278	0.279	0.265	0.265	0.259	0.239	0.274
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.539	2.521	2.473	2.454	2.484	2.446	2.466	2.473	2.505	2.466	2.513	2.489	2.490	2.458	2.502	2.504	2.473	2.503	2.526	2.512	2.502	2.517	2.506
0.013	0.010	0.009	0.014	0.003	0.008	0.006	0.012	0.008	0.016	0.015	0.013	0.013	0.014	0.010	0.005	0.015	0.014	0.018	0.007	0.012	0.019	0.016
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.087	0.098	0.110	0.119	0.107	0.116	0.116	0.108	0.108	0.112	0.094	0.097	0.102	0.105	0.102	0.102	0.101	0.100	0.095	0.095	0.094	0.087	0.099
0.135	0.153	0.134	0.182	0.116	0.114	0.154	0.137	0.198	0.162	0.161	0.110	0.131	0.082	0.157	0.160	0.103	0.165	0.177	0.150	0.134	0.143	0.178
0.559	0.562	0.438	0.551	0.389	0.355	0.477	0.459	0.654	0.519	0.617	0.413	0.465	0.285	0.552	0.560	0.373	0.593	0.667	0.565	0.515	0.598	0.651

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
125	126	127	128	129	130	132	133	134	135	136	137	138	139	140	141	142	143	144	145	148	149	150
42.17	41.84	41.15	40.85	40.95	40.68	40.93	40.25	41.00	41.16	41.58	41.32	41.23	41.25	41.64	41.30	41.19	41.56	42.01	41.69	41.73	41.82	41.53
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.48	1.06	1.08	1.83	1.47	1.43	1.60	2.37	1.56	1.32	1.42	1.23	2.06	1.23	1.39	1.25	1.35	1.94	1.07	1.29	0.99	0.88	0.90
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.64	6.65	7.10	7.11	7.54	7.42	7.53	7.08	6.87	7.31	7.43	7.79	7.23	6.92	7.67	7.33	6.77	5.80	6.18	6.50	7.23	6.63	6.99
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36.88	37.06	36.51	36.71	36.21	36.33	36.86	35.65	35.54	36.59	36.47	36.36	35.19	36.42	36.59	37.05	36.21	37.15	38.03	36.16	37.00	37.24	36.39
0.17	0.39	0.20	0.21	0.17	0.25	0.30	0.17	0.13	0.23	0.32	0.20	0.10	0.12	0.22	0.29	0.29	0.24	0.01	0.39	0.35	0.26	0.23
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87.33	86.99	86.03	86.71	86.34	86.10	87.21	85.52	85.10	86.61	87.22	86.91	85.80	85.95	87.50	87.22	85.81	86.70	87.31	86.04	87.29	86.83	86.04
1.915	1.906	1.899	1.868	1.887	1.877	1.864	1.870	1.916	1.888	1.897	1.893	1.916	1.905	1.894	1.879	1.906	1.893	1.899	1.924	1.898	1.907	1.917
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.079	0.057	0.058	0.099	0.080	0.077	0.086	0.130	0.086	0.072	0.076	0.066	0.113	0.067	0.074	0.067	0.074	0.104	0.057	0.070	0.053	0.047	0.049
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.252	0.253	0.274	0.272	0.290	0.286	0.286	0.275	0.268	0.280	0.283	0.298	0.281	0.267	0.291	0.279	0.262	0.221	0.234	0.251	0.275	0.253	0.270
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.495	2.515	2.509	2.501	2.485	2.497	2.500	2.467	2.474	2.499	2.478	2.482	2.436	2.505	2.479	2.511	2.495	2.520	2.560	2.486	2.507	2.530	2.503
0.008	0.019	0.010	0.010	0.009	0.012	0.015	0.009	0.006	0.011	0.016	0.010	0.005	0.006	0.011	0.014	0.014	0.012	0.000	0.019	0.017	0.013	0.012
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.092	0.091	0.098	0.098	0.105	0.103	0.103	0.100	0.098	0.101	0.103	0.107	0.103	0.096	0.105	0.100	0.095	0.081	0.084	0.092	0.099	0.091	0.097
0.090	0.131	0.144	0.165	0.147	0.168	0.187	0.131	0.083	0.153	0.130	0.147	0.056	0.123	0.137	0.174	0.115	0.110	0.145	0.082	0.150	0.138	0.117
0.358	0.518	0.527	0.606	0.506	0.587	0.654	0.476	0.308	0.545	0.460	0.492	0.199	0.461	0.471	0.626	0.441	0.498	0.623	0.327	0.547	0.547	0.433

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173
41.57	41.68	41.03	41.37	40.77	40.90	41.51	41.14	41.01	40.60	41.52	40.54	40.77	41.14	40.77	40.99	40.82	41.12	41.49	41.87	41.56	41.49	41.55
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.26	1.22	1.25	1.27	1.36	1.77	1.49	1.86	1.91	2.20	0.95	1.21	1.13	1.22	1.08	1.35	1.11	0.88	1.04	0.96	1.68	1.30	1.14
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.42	6.43	6.41	7.15	6.85	6.78	6.58	6.35	6.50	6.47	7.90	7.75	8.64	7.85	8.19	8.05	8.02	7.45	6.18	5.86	6.93	6.22	5.91
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36.33	36.84	36.70	36.25	36.17	37.13	36.86	36.91	36.66	37.07	35.93	35.89	35.43	35.44	35.80	35.89	36.10	37.09	36.71	37.61	37.37	36.98	37.49
0.43	0.21	0.37	0.12	0.31	0.06	0.14	0.33	0.38	0.24	0.06	0.10	0.28	0.16	0.37	0.22	0.21	0.25	0.57	0.15	0.30	0.10	0.34
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87.00	86.38	85.76	86.15	85.45	86.63	86.58	86.58	86.46	86.58	86.35	85.48	86.25	85.81	86.21	86.49	86.26	86.78	85.99	86.46	87.85	86.09	86.42
1.902	1.911	1.894	1.908	1.893	1.868	1.899	1.879	1.878	1.853	1.918	1.888	1.891	1.914	1.887	1.890	1.886	1.880	1.910	1.911	1.874	1.905	1.897
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.068	0.066	0.068	0.069	0.075	0.095	0.080	0.100	0.103	0.118	0.052	0.066	0.062	0.067	0.059	0.073	0.060	0.047	0.057	0.052	0.089	0.071	0.061
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.284	0.246	0.247	0.276	0.266	0.259	0.252	0.243	0.249	0.247	0.305	0.301	0.335	0.305	0.317	0.310	0.310	0.285	0.238	0.224	0.261	0.239	0.225
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.476	2.516	2.523	2.491	2.501	2.526	2.512	2.512	2.501	2.520	2.472	2.489	2.448	2.456	2.469	2.465	2.484	2.526	2.518	2.557	2.511	2.530	2.550
0.021	0.010	0.018	0.006	0.015	0.003	0.007	0.016	0.018	0.012	0.003	0.005	0.014	0.008	0.018	0.011	0.010	0.012	0.028	0.007	0.014	0.005	0.016
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.103	0.089	0.089	0.100	0.096	0.093	0.091	0.088	0.091	0.089	0.110	0.108	0.120	0.111	0.114	0.112	0.111	0.101	0.086	0.080	0.094	0.086	0.081
0.129	0.112	0.145	0.114	0.139	0.170	0.121	0.141	0.140	0.176	0.112	0.158	0.155	0.105	0.167	0.146	0.168	0.192	0.123	0.127	0.162	0.118	0.145
0.454	0.453	0.586	0.414	0.524	0.656	0.482	0.581	0.564	0.713	0.369	0.524	0.464	0.345	0.526	0.470	0.544	0.676	0.519	0.567	0.620	0.497	0.643

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
174	175	176	177	178	180	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198
41.41	41.17	41.43	40.24	42.61	41.65	40.77	41.62	41.79	39.22	40.08	39.73	41.17	40.47	41.25	42.54	42.27	41.53	41.82	40.48	40.25	39.11	38.76
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.33	1.22	1.17	1.21	2.17	1.54	1.42	1.38	1.53	0.53	1.10	0.79	0.89	1.19	1.26	1.47	0.95	1.30	1.29	1.02	1.09	0.83	0.86
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.27	6.66	7.42	7.87	7.57	6.65	5.60	6.61	5.66	11.82	10.93	10.67	9.20	9.33	8.37	8.29	7.57	8.61	8.78	9.18	10.66	12.00	11.98
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37.78	37.27	36.35	35.98	33.86	36.68	37.46	36.26	36.94	34.43	34.68	34.56	35.39	35.33	35.62	35.55	36.23	35.56	35.20	35.16	34.43	34.56	34.59
0.24	0.35	0.20	0.40	0.12	0.32	0.31	0.17	0.23	0.16	0.37	0.23	0.37	0.07	0.12	0.09	0.22	0.17	0.21	0.24	0.14	0.08	0.28
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87.02	86.66	86.58	85.70	86.32	86.84	85.55	86.05	86.15	86.14	87.15	85.99	87.02	86.38	86.62	87.95	87.23	87.19	87.30	86.08	86.57	86.58	86.47
1.878	1.879	1.904	1.869	1.983	1.902	1.875	1.920	1.916	1.841	1.856	1.863	1.898	1.878	1.904	1.938	1.932	1.907	1.923	1.885	1.876	1.827	1.812
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.071	0.066	0.063	0.066	0.119	0.083	0.077	0.075	0.083	0.029	0.060	0.044	0.048	0.065	0.068	0.079	0.051	0.071	0.070	0.056	0.060	0.045	0.047
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.238	0.254	0.285	0.305	0.295	0.254	0.215	0.255	0.217	0.464	0.423	0.418	0.355	0.362	0.323	0.316	0.289	0.331	0.337	0.357	0.415	0.469	0.468
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.552	2.534	2.488	2.489	2.347	2.495	2.567	2.491	2.523	2.408	2.392	2.414	2.430	2.442	2.449	2.413	2.467	2.433	2.410	2.439	2.391	2.405	2.409
0.012	0.017	0.010	0.020	0.006	0.016	0.015	0.008	0.011	0.008	0.019	0.012	0.018	0.003	0.006	0.004	0.011	0.008	0.010	0.012	0.007	0.004	0.014
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.085	0.091	0.103	0.109	0.111	0.092	0.077	0.093	0.079	0.161	0.150	0.148	0.127	0.129	0.117	0.116	0.105	0.120	0.123	0.128	0.148	0.163	0.163
0.174	0.176	0.129	0.195	-0.085	0.113	0.172	0.085	0.085	0.288	0.228	0.231	0.155	0.179	0.124	0.044	0.084	0.115	0.085	0.173	0.187	0.300	0.329
0.730	0.693	0.454	0.639	-0.290	0.444	0.800	0.333	0.392	0.621	0.539	0.553	0.438	0.494	0.385	0.141	0.292	0.347	0.253	0.484	0.451	0.641	0.704

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221
41.28	38.40	38.63	40.09	39.17	39.79	41.05	39.83	40.19	39.65	39.34	39.69	41.64	39.12	39.34	39.59	38.41	39.24	39.70	40.66	40.19	39.64	40.44
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	1.08	1.13	1.21	1.16	1.34	1.18	1.32	1.34	1.07	1.21	1.17	1.45	1.99	1.09	1.17	1.07	1.12	1.17	1.31	1.18	1.66	1.22
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.39	11.47	11.58	10.94	11.02	10.61	9.11	9.51	10.86	11.02	11.10	11.39	10.02	10.34	10.95	11.97	11.90	11.71	10.57	10.40	10.32	8.44	10.19
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.54	32.87	33.70	33.78	34.57	34.89	35.64	34.43	34.84	33.98	34.33	34.88	34.94	32.35	33.57	33.79	33.53	34.04	34.78	34.88	35.34	33.01	34.63
0.08	0.12	0.27	0.40	0.18	0.16	0.34	0.16	0.22	0.08	0.23	0.23	0.18	0.00	0.18	0.14	0.36	0.26	0.16	0.05	0.22	0.17	0.16
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86.78	83.93	85.31	86.42	86.09	86.79	87.32	85.26	87.44	85.80	86.20	87.37	88.24	83.79	85.13	86.66	85.26	86.37	86.38	87.29	87.25	82.92	86.63
1.914	1.855	1.833	1.878	1.835	1.846	1.884	1.877	1.854	1.868	1.842	1.834	1.902	1.891	1.869	1.854	1.826	1.840	1.851	1.877	1.852	1.921	1.881
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.082	0.062	0.063	0.067	0.064	0.073	0.064	0.073	0.073	0.059	0.067	0.064	0.078	0.113	0.061	0.065	0.060	0.062	0.064	0.071	0.064	0.095	0.067
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.364	0.463	0.459	0.428	0.431	0.412	0.349	0.375	0.419	0.434	0.435	0.440	0.383	0.418	0.435	0.468	0.473	0.459	0.412	0.401	0.397	0.342	0.396
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.386	2.365	2.382	2.357	2.411	2.411	2.436	2.417	2.394	2.385	2.395	2.401	2.378	2.329	2.376	2.357	2.374	2.377	2.415	2.399	2.426	2.383	2.399
0.004	0.006	0.014	0.020	0.009	0.008	0.017	0.008	0.011	0.004	0.012	0.011	0.009	0.000	0.009	0.007	0.018	0.013	0.008	0.002	0.011	0.009	0.008
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.132	0.164	0.162	0.154	0.152	0.146	0.125	0.134	0.149	0.154	0.154	0.155	0.139	0.152	0.155	0.166	0.166	0.162	0.146	0.143	0.141	0.126	0.142
0.089	0.229	0.272	0.177	0.267	0.235	0.169	0.173	0.220	0.205	0.249	0.268	0.117	0.105	0.201	0.228	0.289	0.259	0.234	0.175	0.232	0.063	0.172
0.245	0.495	0.592	0.414	0.619	0.570	0.484	0.461	0.525	0.472	0.572	0.610	0.306	0.252	0.461	0.488	0.611	0.565	0.568	0.437	0.584	0.185	0.434

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244
40.59	39.14	39.72	40.19	39.84	38.66	39.08	39.82	40.66	41.40	40.47	40.68	41.03	40.57	40.30	40.09	38.69	40.01	40.07	40.72	39.82	39.76	40.73
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.19	1.29	1.27	1.43	1.41	1.14	1.22	1.27	1.35	1.63	1.56	1.68	1.19	1.35	1.33	1.82	0.31	1.13	1.16	1.32	1.29	1.26	1.23
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.12	12.06	11.70	11.01	10.10	11.97	11.75	10.99	9.66	9.38	8.74	9.20	10.05	10.66	10.67	10.72	12.74	10.69	10.39	9.72	10.15	9.72	10.81
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.20	34.28	33.93	34.13	32.75	33.37	33.35	34.27	34.10	35.51	33.63	34.54	34.94	34.69	34.17	34.17	33.54	34.87	34.75	34.51	33.95	34.26	35.09
0.16	0.31	0.24	0.22	0.20	0.10	0.16	0.14	0.14	0.10	0.06	0.24	0.31	0.31	0.39	0.30	0.16	0.38	0.25	0.14	0.16	0.21	0.21
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86.26	87.08	86.87	86.98	84.30	85.23	85.57	86.49	85.92	88.02	84.45	86.33	87.52	87.57	86.85	87.09	85.44	87.07	86.63	86.42	85.37	85.21	88.07
1.898	1.820	1.853	1.869	1.913	1.840	1.853	1.860	1.907	1.888	1.927	1.894	1.888	1.870	1.875	1.859	1.841	1.852	1.863	1.897	1.881	1.877	1.865
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.066	0.071	0.070	0.079	0.080	0.064	0.068	0.070	0.075	0.088	0.087	0.092	0.065	0.073	0.073	0.099	0.017	0.062	0.064	0.072	0.072	0.070	0.066
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.395	0.469	0.456	0.428	0.405	0.476	0.466	0.429	0.379	0.357	0.348	0.358	0.387	0.411	0.415	0.415	0.507	0.414	0.404	0.378	0.401	0.383	0.414
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.382	2.375	2.358	2.364	2.342	2.365	2.355	2.384	2.382	2.412	2.385	2.395	2.395	2.381	2.368	2.361	2.377	2.404	2.407	2.395	2.389	2.409	2.394
0.008	0.016	0.012	0.011	0.010	0.005	0.008	0.007	0.007	0.005	0.003	0.012	0.015	0.015	0.019	0.015	0.008	0.019	0.013	0.007	0.008	0.011	0.010
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.142	0.165	0.162	0.153	0.148	0.168	0.165	0.153	0.137	0.129	0.127	0.130	0.139	0.147	0.149	0.150	0.176	0.147	0.144	0.136	0.144	0.137	0.147
0.138	0.289	0.223	0.184	0.095	0.257	0.226	0.211	0.111	0.137	0.059	0.121	0.159	0.188	0.177	0.182	0.302	0.235	0.210	0.133	0.167	0.176	0.203
0.348	0.616	0.490	0.431	0.234	0.539	0.485	0.491	0.293	0.383	0.170	0.338	0.411	0.457	0.427	0.438	0.595	0.567	0.521	0.353	0.416	0.459	0.490

4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC	ACC
245	246	247	248	249	250	252	253	254	255	256	257	258	259	260	261	262	263	264	265	285	286	287
40.24	40.15	40.21	39.56	40.14	39.85	39.19	39.80	39.51	39.86	40.05	40.12	39.68	39.96	39.77	39.38	39.39	39.04	39.54	39.52	41.25	41.71	41.40
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.24	1.13	1.17	1.14	1.12	1.05	1.12	1.13	1.28	1.18	1.49	1.28	1.18	1.29	1.37	1.20	1.12	1.12	1.27	1.11	1.25	1.46	1.57
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10.72	10.59	11.31	11.38	11.86	12.23	10.87	10.44	11.48	10.99	10.79	10.98	10.77	11.20	10.35	10.88	11.25	11.37	11.06	11.49	9.05	8.55	8.73
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34.60	34.42	34.27	33.40	33.60	33.94	34.04	34.23	34.20	34.54	34.18	34.18	34.41	34.10	34.56	33.65	34.13	34.07	34.55	33.79	35.62	35.18	35.48
0.33	0.35	0.34	0.16	0.30	0.11	0.31	0.27	0.15	0.25	0.24	0.16	0.25	0.45	0.13	0.25	0.16	0.08	0.18	0.05	0.09	0.00	0.09
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87.13	86.65	87.30	85.64	87.02	87.18	85.53	85.87	86.61	86.82	86.75	86.72	86.29	87.00	86.18	85.36	86.05	85.67	86.60	85.95	87.27	86.89	87.27
1.864	1.870	1.864	1.873	1.874	1.856	1.850	1.869	1.845	1.853	1.865	1.871	1.855	1.859	1.858	1.865	1.850	1.842	1.842	1.862	1.894	1.924	1.900
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.068	0.062	0.064	0.064	0.062	0.057	0.062	0.062	0.070	0.065	0.081	0.070	0.065	0.071	0.076	0.067	0.062	0.062	0.070	0.061	0.068	0.079	0.085
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.415	0.412	0.438	0.450	0.463	0.476	0.429	0.410	0.448	0.427	0.420	0.428	0.421	0.435	0.404	0.431	0.442	0.449	0.431	0.452	0.347	0.330	0.335
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.387	2.388	2.367	2.355	2.336	2.355	2.393	2.395	2.379	2.392	2.371	2.374	2.397	2.363	2.406	2.374	2.388	2.394	2.398	2.372	2.436	2.417	2.426
0.016	0.017	0.017	0.008	0.015	0.006	0.015	0.013	0.007	0.012	0.012	0.008	0.013	0.022	0.006	0.012	0.008	0.004	0.009	0.003	0.004	0.000	0.004
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.148	0.147	0.156	0.160	0.165	0.168	0.152	0.146	0.158	0.151	0.150	0.153	0.149	0.156	0.144	0.154	0.156	0.158	0.152	0.160	0.125	0.120	0.121
0.204	0.198	0.207	0.191	0.190	0.231	0.237	0.199	0.239	0.228	0.188	0.189	0.225	0.211	0.208	0.203	0.238	0.255	0.246	0.215	0.144	0.073	0.115
0.492	0.480	0.473	0.424	0.411	0.484	0.553	0.485	0.534	0.535	0.448	0.441	0.534	0.486	0.515	0.470	0.539	0.568	0.570	0.475	0.415	0.221	0.344

4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12	4.750 12
ACC 288	ACC 289	ACC 290	ACC 311	ACC 312	ACC 313	ACC 314	ACC 315	ACC 316	ACC 317	ACC 318	ACC 319	ACC 320
40.81	41.06	41.59	41.46	41.06	41.61	42.13	41.27	41.26	42.12	41.90	41.76	40.10
-	-	-	-	-	-	-	-	-	-	-	-	-
1.48	1.48	1.55	1.00	1.57	1.15	1.01	1.04	1.31	1.21	1.29	1.27	0.88
-	-	-	-	-	-	-	-	-	-	-	-	-
8.85	8.23	8.37	9.12	9.66	8.74	8.44	8.04	8.72	8.54	8.58	8.52	10.34
-	-	-	-	-	-	-	-	-	-	-	-	-
34.94	35.16	35.03	35.46	35.21	35.46	36.01	35.64	35.72	35.43	36.21	35.90	35.40
0.31	0.01	0.28	0.25	0.30	0.14	0.21	0.22	0.14	0.03	0.33	0.37	0.22
-	-	-	-	-	-	-	-	-	-	-	-	-
86.39	85.94	86.82	87.29	87.79	87.10	87.80	86.20	87.14	87.33	88.31	87.83	86.93
1.894	1.911	1.920	1.905	1.880	1.914	1.920	1.912	1.895	1.933	1.898	1.903	1.854
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.081	0.081	0.084	0.054	0.084	0.063	0.054	0.057	0.071	0.065	0.069	0.068	0.048
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.343	0.320	0.323	0.350	0.370	0.336	0.321	0.311	0.335	0.328	0.325	0.325	0.400
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.416	2.438	2.409	2.428	2.401	2.430	2.444	2.459	2.443	2.422	2.443	2.437	2.438
0.016	0.000	0.014	0.012	0.015	0.007	0.010	0.011	0.007	0.001	0.016	0.018	0.011
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750	4.750
0.124	0.116	0.118	0.126	0.133	0.121	0.116	0.112	0.120	0.119	0.117	0.118	0.141
0.131	0.097	0.075	0.135	0.156	0.109	0.106	0.120	0.140	0.068	0.136	0.127	0.244
0.381	0.304	0.233	0.386	0.421	0.323	0.331	0.385	0.418	0.207	0.418	0.390	0.611