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PHYSICO-CHEMICAL CHARACTERIZATION OF DIFFERENT BRAKE PAD WEAR EMISSIONS

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Nowadays little is known about the mass, size and composition of PM emitted by different brake pads in different braking conditions [1]. Four different commercial brake pads (two low-steel and two non-asbestos organic) were tested by means of AK Master test procedure (a test based on dynamometer to screen the friction material effectiveness by varying braking parameters) [2]. Emitted brake wear particles were collected by means of a Dekati Low-Pressure Impactor (DLPI).

For each tested pad, the 13 samples collected at each impactor stage during three sections of the test were weighed and then subjected to acid digestion and ICP-OES and ICP-MS elemental analysis; a set of 56 elements was analysed. A high portion of the emitted PM mass is represented by undetermined materials (*i.e.*, anions, silica, organic compounds, and humidity), particularly for the fine and ultrafine fractions collected during the AK Master section 9 (Fade). Clear differences in the inorganic composition of the PM released by the four pads were observed: the low-steel pads emitted a PM rich in Al, Fe and Mg, and the non-asbestos organic pads emitted a PM rich in Ba, Ca, K, Sn, Ti and Zr.

The driving style has a rather strong impact on PM emission, as it influences not only the quantity of emitted PM, but also its size distribution. Strong and frequent braking events may determine a major increase in both the emitted mass and the proportion of fine and ultrafine fractions. In addition, the driving style also influences the composition of emitted PM, and sometimes a sharp increase of the relative content of some metals was observed for fine and ultrafine fractions.

References

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