Environmental managing of bottom ashes from municipal thermovalorization waste for civil applications, as a function of particle size, based on steam washing

EGU2020-17649
https://doi.org/10.5194/egusphere-egu2020-17649
EGU General Assembly 2020

Environmental managing of bottom ashes from municipal thermovalorization waste for civil applications, as a function of particle size, based on steam washing

Caterina Caviglia[1], Enrico Destefanis[1], Davide Bernasconi[1], Linda Pastero[1], Giorgia Confalonieri[2], Ingrid Corazzari[3], Francesco Turci[3], Costanza Bonadiman[4], Renzo Tassinari[4], and Alessandro Pavese[1]

[1]Università degli Studi di Torino, Dipartimento di Scienze della Terra, Torino, Italy (caterina.caviglia@unito.it)
[2]Università degli Studi di Modena e Reggio Emilia, Dipartimento di Scienze Chimiche e Geologiche,Modena e Reggio Emilia, Italy
[3]Università degli Studi di Torino, Dipartimento di Chimica, Torino, Italy
[4]Università di Ferrara, Dipartimento di Fisica e Scienze della Terra, Ferrara, Italy

Nowadays, the production of constructional materials requires raw materials obtained through extractive activities that often imply different environmental impacts. In a perspective of a growing sensitivity towards a responsible use of natural resources the attention to materials coming from waste is focused. The waste from the municipal thermovalorization plants can be suitable for this applications, and after moderate and sustainable treatments, can find a role of raw material-second in the construction of works, reducing the need to find additional natural resources and related problems for disposal or storage. The present study aims to explore the possibility of promoting inertization (i.e. reducing the BA's release in water of environmentally dangerous chemical species below the legal thresholds) of as large a fraction of BA as possible, using ashes from one of the municipal waste incineration plants of Northern Italy, and exploiting byproducts of the incineration cycle, i.e. the spared steam from turbines, which produce electricity, and carbon dioxide from combustion fumes. The treatments discussed are as a function of the particle size (s). BA are partitioned into three main classes, determined by previous studies $s \geq 4.75$, $4.75 > s \geq 1$, $s < 1$ mm; %. The BA fraction with $4.75 > s \geq 1$ mm was further divided into two portions to optimize the steam washing process: $4.75 > s \geq 2$ mm and $2 > s \geq 1$ mm. BA with $s > 4.75$ mm are treated with steam washing only. In fact, although they do not contain high concentrations of heavy metals, they largely surpass the Italian legislation thresholds related to the occurrence of chlorides and sulfates. Steam is generally available from modern incineration plants in a considerable amount, and it is more effective than water in removing a variety of impurities/low-crystallinity fragments from the surface of coarse grains. Inertization of BA with $4.75 > s \geq 1$ is investigated by means of both steam washing and accelerated carbonation, to optimize the combination of these methods and expand as much as possible the s-range that requires steam washing only. As to the BA fraction with $s < 1$ mm, whose heavy metals content is likely larger than elsewhere, steam washing is of difficult application and therefore we resort to accelerated carbonation.