Geophysical Research Abstracts
Vol. 13, EGU2011-9012, 2011
EGU General Assembly 2011

Evaluating the role of tin (SnO2) as a natural mineralizer-oxide on the cement properties

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Cement has a wide range of uses like in pottery, construction and manufacturing; all of them require a high-potential of energy consumption. Due to that, scientists and manufacturers use admixtures in order to achieve a balance between energy and quality. Such admixtures play, indirectly, an important role in the green gases emissions; though the lower the energy consumption the lower the gas emissions like CO2 (Taylor 1990). Only small amounts of admixtures (< 2 wt%) could control the temperature, at which high-quality klinker is produced. Recently, Paceagiu et al. (2009) and Bădănoiu et al. (2009) were study the influence of NaF, KF, SnO2 and TiO2 and their mixtures concluding that these add-ins decrease the temperature at which starts the dissociation process of the calcium carbonate from the raw mix. However, the influence of fluorides on burnability of raw mix is more intense as compared to that of oxides.

In this work we evaluate the role of a natural mineralizer-oxide like tin (SnO2) on the cement properties. In particular, the effect of different quantities of SnO2 with 0.5, 1.0, 1.5 and 2.0 wt% on burnability of industrial raw mix is studied by free lime evaluation. Four datasets were obtained, with successive increase of temperature at 1250, 1350, 1400 and 1450degC. The produced tin-added clinker is studied in terms of X-ray diffraction (XRD), thermal analysis (DTA) and scanning electron microscopy (SEM). Though, we characterize the new phases formed and whether or not, the addition of excess SnO2 is promote the formation of C3S, C2S influencing the final quality of cement.

Our results show that during cement production the addition of tin in the raw mix influences positively the heat treatment¬ and lowers more intensively the values of free lime; though the best results were obtained with SnO2=1 wt%. Hence, the presence of tin, results in the following: (1) promotes the creation of white, needle-like, crystals of Ca2SnO4 and (2) easier formation of C3S (alite) instead of C2S (belite). Finally, cements that contain tin as an add-mixture show a small delay in their early hydration, which ceases after 28 days.

References

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