Abstract

Cement samples composed of 96% clinker - 4% recycled calcium sulphates (RCS) from construction and demolition wastes (CDW) were investigated by thermal analysis (DSC), X-ray diffraction and scanning electron microscopy. The samples were prepared by mixing, grinding and heating the components at 110 ºC, 150 ºC and 170 ºC (to modify the different phases), whereas the tests were performed after submitting them (1, 7, 14, 21 and 28 days) to a wet or dry medium in two desiccators with distilled water and calcium chloride, respectively. The evolution of the phases shows that the waste gypsum acts as set retarder of cement, avoiding the quick hydration of calcium aluminate ($Al_2O_3 \cdot 3CaO$)1 in the first hours of preparation (whose effects on the cement properties are generally undesirable). Results suggest that the heat generated in grinding can be enough to achieve the dehydration of plasters, while the clinker extracts part of the water of gypsum through an endothermic reaction and this paste produces a "delay" in cement flash setting2. Thus, we propose to include RCS (present in construction debris) as additive in cement manufacturing, optimizing the chain of value of new construction products, reducing the energy consumption for extraction of natural gypsum, the temperatures that are necessary for partial dehydration of these residues, as well as the cement processing and mortar setting conditions.

Biography

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References (With Hyperlink)

[1] H.F.W. Taylor. Cement Chemistry, second ed., Thomas Telford, London, 1997.

[2] N. Flores Medina et al. Characterization of a more sustainable cement produced with recycled drywall and plasterboards as set retarders, Construction and Building Materials 124 (2016) 982–991.

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