

Production of low porosity recycled sand from construction and demolition waste

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Abstract

The existing construction waste recycling technologies and standards have been long applied in construction and demolition (C&D) waste recycling, mainly focused on the production and use of coarse recycled aggregates. Very few papers and process focus on the production of recycled sand although some previous results show that fine aggregates fraction (below 4.8 mm) represents around 40 to 60% (in mass) of the Brazilian waste and it is usually down cycled as road sub-base or disposed in landfills. The quality of the recycled aggregate is strictly related to the content of porous and low strength phases, as the patches of cement attached to the recycled aggregate. Despite being the crucial factor for aggregate performance, the removal of adhered cement paste is not a simple task. Some technologies have already been described in the literature, even though, to the moment none of these technologies has clearly succeeded in reaching the large market available.

This paper presents a summary of the main properties of the sand produced from C&D waste by tertiary crushing at vertical shaft impactor crusher (attrition and abrasion comminution). Additionally mineral processing technologies were applied on the attained product, such as density concentration by shaking table and spirals and magnetic separation at rare earth roll separator. The main properties of recycled sand are discussed and compared to the previous C&D waste, respectively: apparent density, water absorption, chemical composition, porosity, particle shape and cement paste content.

The results demonstrated that the comminution by vertical shaft impact crusher allowed producing a VSI-sand with low porosity and water absorption. The concentration by shaking table at narrow sieve fractions led to a product with low porosity and reduced content of cement paste, although products from spiral concentrator for the bulk sample had only the effect of classification instead of concentration. The non-magnetic products presented similar characteristics of the heavy product from the shaking table plus separation of micaceous minerals. The aim of producing sand from construction and demolition waste through mineral processing unit operations changes the recycling approach and contributes for upcycling the recycled sand.

Keywords: recycled sand, mineral processing, CDW recycling, products characterization, mineral separability.