

Evaluation of Pozzolanic Properties of Micro and Nanofillers Origin from Waste Products

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Abstract : About 8 % of CO₂ emission in the world is produced by concrete industry therefore replacement of cement in concrete composition by additives with pozzolanic activity would give a significant impact on the environment. Material which contains silica SiO₂ or amorphous silica SiO₂ together with aluminum dioxide Al₂O₃ is called pozzolana type additives in the concrete industry. Pozzolana additives are possible to obtain from recycling industry and different production by-products such as processed bulb boric silicate (DRL type) and lead (LB type) glass, coal combustion bottom ash, utilized brick pieces and biomass ash, thus solving utilization problem which is so important in the world, as well as practically using materials which previously were considered as unusable. In the literature, there is no summarized method which could be used for quick waste-product pozzolana activity evaluation without the performance of wide researches related to the production of innumerable concrete contents and samples in the literature. Besides it is important to understand which parameters should be predicted to characterize the efficiency of waste-products. Simple methods of pozzolana activity increase for different types of waste-products are also determined. The aim of this study is to evaluate effectiveness of the different types of waste materials and industrial by-products (coal combustion bottom ash, biomass ash, waste glass, waste kaolin and calcined illite clays), and determine which parameters have the greatest impact on pozzolanic activity. By using materials, which previously were considered as unusable and landfilled, in concrete industry basic utilization problems will be partially solved. The optimal methods for treatment of waste materials and industrial by-products were detected with the purpose to increase their pozzolanic activity and produce substitutes for cement in the concrete industry. Usage of mentioned pozzolanic allows us to replace of necessary cement amount till 20% without reducing the compressive strength of concrete.

Keywords : cement substitutes, micro and nano fillers, pozzolanic properties, specific surface area, particle size, waste products

Conference Title : ICCSGE 2016 : International Conference on Concrete, Structural and Geotechnical Engineering

Conference Location : Istanbul, Türkiye

Conference Dates : January 25-26, 2016