Synthesis and Characterization of Nanosilica from Rice Husk Ash Prepared by Precipitation Method

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ABSTRACT

Nanosilica was prepared by precipitation method and characterized by various analytical techniques. Transmission electron micrographs show nanosilica particles are in the agglomerate form with dimension of 50 nm. The particle shape was found to be uniform and agglomerated. The diffraction pattern of the particles shows a diffuse ring pattern with indicative of amorphous phase. X-ray diffractograms show that the obtained product is amorphous nanosilica and the specific surface area is 656 m^2g^{-1}. Subsequently, the infrared spectra data supports the presence of hydrogen bonded silanol group and siloxane groups in silica. In this study, nanosilica was introduced in cement paste. From the experimental results, it was found that the incorporation of the nanosilica in the cement paste increase the compressive strength when compared withthat of the portland cemen paste.

Key words: Nanosilica, Precipitation, Cement paste, Compressive strength

INTRODUCTION

Rice husk ash (RHA) is one of the most silica rich raw materials containing about 90-98% silica after a complete combustion. The selection of ash is important as the quality of ash determines the total amount as well as quality of silica recoverable. The initial step is extraction of silica from ash as sodium silicate using caustic soda (Kalapathy et al., 2000).

The reaction is as follows.

$SiO_2 + NaOH \rightarrow Na_2SiO_3 + H_2O$

(ash) (sodium hydroxide) (sodium silicate) (water)

In the second step of the process, silica is precipitated from sodium silicate using sulphuric acid

The reaction is as follows.

$Na_2SiO_3 + H_2SO_4 \rightarrow SiO_2 + Na_2SO_4 + H_2O$

(sodium silicate) (sulphuric acid) (silica) (sodium sulphate) (water)