

Application of Quartz Nanoparticles as Mineral Admixture in Cement Pastes

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The development of high performance concretes was possible through the evolution and utilization of supplementary materials known as admixtures, which can be categorized in chemical or mineral [1]. There are many mineral admixtures utilized in concretes, such as the most common silica fume, but recently with the advancement of nanotechnology, sub-micron and nano-sized materials have been studied as new admixtures to improve the performance of cementitious materials [2,3]. This work studied the application of quartz nanoparticles in cement pastes as a partial substitute of Portland cement and compared the results with silica fume addition. The two admixtures were characterized by x-ray fluorescence and x-ray diffraction in order to identify and analyse the differences between them. It was performed compressive strength tests in the cement pastes at 7, 28 and 90 days of curing age and the crushed samples of the pastes were analysed by scanning electron microscopy. The results show that at 90 days of curing age the mean of the compressive strength of cement paste without admixture is 63.23 MPa and it is statistically the same of the pastes with silica fume and quartz. Thus, it was concluded that quartz nanoparticles can be used as partial substitute of cement in pastes and it is a potential new admixture that should be studied in mortars and concretes.

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