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Investigating the different sonication parameters to obtain the optimum sonication process for nano silica and nano clay in concrete

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One of the main problems is that the use of nanomaterials in the construction industry is the reduction of the level of workability. This phenomenon occurs after adding nanomaterials to the mixing water. Many researches worked on improving the workability of concrete and cement mortars after adding nanomaterials. Sonication is one of the methods used to de-agglomerate nanoparticles and to improve their dispersion in concrete. This research aims to reach the optimum sonication parameters to improve the dispersion of nano silica and nano clay in concrete. These parameters are the type of sonication, the sonication power, optimum solid to liquid ratio and optimum sonication time. Particle size distribution of the sonicated nanoparticles and the corresponding specific surface area were the main keys governing the optimization process of the studied parameters. Using the optimum solid to liquid ratio with the corresponding sonication time, slump and the compressive strength of nano silica and nano clay concrete were examined and compared with those without nano silica and nano clay. In addition, the microstructural analysis using SEM and XRD helped in confirming the compressive strength results. Also, the durability properties of concrete were studied to monitor the effect of sonication on the chloride ion permeability and abrasion resistance of concrete. Also, the absorption of concrete and the corrosion rate of the steel rebar were studied after using sonicated nano silica and nano clay.

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