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Nanomechanical Properties of Coconut Shell Ash Blended Cement Mortar

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Abstract : This research used Grid indentation technique to investigate the effect of the addition of Coconut Shell Ash (CSA) on the nanomechanical properties of the main phases of the hydrated cement paste. Portland cement was partially replaced with 15% CSA at a water-binder ratio of 0.5 and cubes casted and cured for 28 days after which they were polished to reduce surface roughness to the barest minimum. The result of nanoindentation shows that addition of 15% CSA to cement paste transforms portlandite to C-S-H by the pozzolanic reaction. More so, there is reduced porosity and a reduction in the volume of CH by the addition of the CSA. Even though the addition of 15% CSA does not drastically change the average values of the hardness and elastic modulus of the two phases of the C-S-H, it greatly modifies their relative proportions, leading to the production of more HD C-S-H. Overall, incorporating 15%CSA to cement mortar improves the Nanomechanical properties of the four main phases of the hydrated cement paste.

Keywords : Coconut Shell Ash, Elastic Modulus, Hardness, Nanoindentation, Porosity
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