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Mechanical Properties of Cement/Bacterial Nano-Cellulose Composite

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Cement is a very important material for building and construction but the main drawback is its brittleness due to high porosity. The brittleness of cement was found to be improved by reinforcing the cement matrix with celluloses extracted from plants. In present work, we studied another type of natural cellulose produced by bacteria, i.e. bacterial nano-cellulose (BNC). The BNC was obtained from the coconut jelly (nata de coco) by cleaning, blending, freeze-drying, and blending again to produce finely dispersed BNC ready to be mixed into cement paste. The liquid to cement ratio was set to 0.45 and the BNC of 0.1, 0.3, 0.5 and 0.7 wt% was added to the mixture. The workability of each mix was tested and controlled. After casting, the samples were demolded after 1 day and soaked in Ca(OH)2 solution. At 7 and 28 days age, the samples were tested for mechanical properties: compressive and flexural strengths. It was found that with the appropriate amount of BNC reinforcement, the brittleness of the cement paste composites could be improved. However, excessive amount of BNC degraded both compressive and flexural strengths. The scanning electron microscope (SEM) was used to observed the fracture surfaces of the samples after mechanical tests. The change in mechanical properties could be explained from the distribution of BNC in the cement matrix.

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