BIOCHAR-MORTAR COMPOSITE: MANUFACTURING, EVALUATION OF PHYSICAL PROPERTIES AND ECONOMIC VIABILITY

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Singapore generates about half a million ton of wood waste annually, which constitutes a major fraction of disposed waste. Pyrolysis of wood waste to produce biochar, which can be used as additive in cement mortar, is a viable alternative to increase recycling rate of woody residues. This study explores the influence of biochar, prepared from mixed wood saw dust, on strength, elastic modulus, drying shrinkage and permeability of cement mortar.

Biochar prepared by pyrolysis at 300 ^{o}C (BC 300) and 500 ^{o}C (BC 500) was added to mortar at 1–8% by weight of cement. Results show that addition of 1–2 wt% BC 300 and BC 500 improve early age (7-day) compressive strength of mortar, which is related to high water retention of 7.50 g/g and 8.78 g/g by dry BC 300 and BC500 respectively.

However, addition of biochar did not significantly influence flexural strength, drying shrinkage and modulus of elasticity. Mortar with 1% addition of BC 300 and BC 500 showed about 58% and 66% reduction in water absorption and depth of water penetration respectively compared to control.

Based on the experimental findings, it is concluded that 1–2 wt% addition of biochar may be recommended to improve strength and reduce permeability of cement mortar. Added at these proportions, we showed that the price of biochar mortar is still reasonably close to that of conventional mortar.

Therefore, this study suggests that biochar from wood waste has the potential to be deployed as carbon sequestering admixture to improve performance of cementitious mortar at a price that is likely to be acceptable to the building industry.