Water-dispersible carbons for ordinary portland cement

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Concrete is widely used as composite material which owned excellent strength and durability, but it is a poor electrical conductor. The conductive property of concrete could be achieved by combining cement-based composite with reinforcement additive that provide the resulting material with inexperience range of applications. This work aims to investigate the effects of activated carbon and carbon fiber additives to enhance the electrical conductivity of concrete. Coconut-shell and hemp-stalk was used as a precursor for activated carbon and carbon fiber, respectively. However, carbon possessed hydrophobic surface which inhibit its dispersion capability in water and cement matrix. The hydrophobicity of carbon could be mediated by functionalization with oxygen-functional groups. Wet oxidation is one of the effective treatment to improve wettability of carbon materials. Mild and aggressive oxidation using 5M aqueous nitric acid are studied. The effect of oxidation treatments on the surface chemistry of carbon samples was characterized by FT-IR. The oxidation can significantly increase the oxygen-functional groups, especially carboxylic group as confirmed by FT-IR. These could improve the dispersibility of carbons in water. Finally, it will be casted into cement blocks with iron-electrodes embedded within and the electrical resistance will be measured.

Keywords: Conductive cement; Activated carbon; Carbon fiber; Wet oxidation