Short Communication

High Strain Sensitivity of Concrete incorporated with Silica Nanoparticles and Corrosion of reinforced steel in NaCl solution

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In this research, the concentration effect of silica nanoparticles on electrochemical and strain sensitivity of smart polymer concretes were investigated. Silica nanoparticles with uniform and spherical morphology was synthesized by in situ sol-gel method. The structural properties of synthesized silica nanoparticles were studied by X-ray diffraction and Fourier transform infrared analyses, showing the amorphous and high stable phase of the nanoparticles. Strain sensitivity of smart polymer concrete was enhanced with increasing the concentration of silica nanoparticles in concretes. A very large variation of resistance was observed under mechanical strain because of higher mobility of silica nanoparticles and their stronger adhesion to the polymer matrix. Electrochemical corrosion of steel rebars were considered by electrochemical impedance spectroscopy technique which indicated that the addition of silica nanoparticles in cement content led to improve the thickness, corrosion resistance and stability of passive film on steel rebar.

Keywords: Smart polymer concrete; Silica nanoparticles; Strain sensitivity; Electrochemical impedance spectroscopy

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