Effect of $[\text{NO}_2^-]/[\text{Cl}^-]$ Ratio on Corrosion Behavior of Fine-grain High-strength Reinforcement in Simulated Concrete Pore Solutions

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The corrosion behavior of fine-grain high-strength reinforcement (HRBF500 reinforcement) in simulated concrete pore (SCP) solutions with various $[\text{NO}_2^-]/[\text{Cl}^-]$ ratios was investigated using polarization and electrochemical impedance spectroscopy (EIS) techniques. The semiconductor property of the passivation film was studied via Mott-Schottky curves. The corrosion products on HRBF500 reinforcement were analyzed through SEM and EDS. The corrosion inhibition efficiency of nitrate for HRBF 500 reinforcement was compared with that for the regular carbon steel reinforcement (HPB235 reinforcement). The results show that more chloride ions in SCP solutions lead to serious cracking of the passivation film on HRBF500 reinforcement. In the presence of nitrite, the corrosion resistance improves. The passivation film is a classical n-type semiconductor. However, the corrosion inhibition by nitrite for HRBF500 reinforcement is less than that for HPB235 reinforcement and the etch pits are still observed.

Keywords: reinforcement; fine grain; corrosion; simulated concrete pore solution; nitrite; polarization; electrochemical impedance spectroscopy

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