Electrochemical Corrosion Behaviour of Concretes with Iron Ore Tailings

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Concrete reinforcement corrosion is one of the most important causes of premature failure of reinforced concrete structure worldwide and generates a great concern due to its effects on global economy. Particularly, marine and environments where chloride ingress were at risk. The objective of this study is to examine the performance of reinforcing concrete incorporating iron ore tailings (IOT), exposed to the chloride contamination with a view of sustainability using waste material from mining to produce concrete. Accelerated corrosion tests were performed on concrete at 50% and 100% IOT replacement of river sand embedded with steel reinforcement. Corrosion current density (i_{corr}) and corrosion rate were determined using linear polarization techniques; which were monitored for corrosion behaviours. The electrochemical impedance spectroscopy (EIS) and electrical resistivity of concrete were also determined. The analysis of results showed that concrete at 50% IOT replacement of river sand has close trend in terms of corrosion current, EIS, concrete resistivity and polarization resistance (*R*p). It seems that there is a potential for the use of IOT as a sustainable and environmentally-friendly in replacing sand for concrete, especially at a 50% replacement level in high strength concrete to resist corrosion. From the strength development, corrosion risk and sustainability stand point, IOT has demonstrated its capability to produce quality and sustainable concrete.

Keywords: Concrete; Electrical Resistivity; Electrochemical Impedance Spectroscopy; Iron Ore Tailings; Linear Polarization Resistance

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