

A  
Dissertation Report  
On

**Electrochemical investigation on Polypyrrole coated RCC  
bar in the simulated concrete pore solution.**

Submitted in partial fulfillment of the requirements of the degree of  
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By

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## ABSTRACT

Epoxy based paint containing conducting polypyrrole as a pigment was applied on low carbon steel sample. By using Linear polarization technique, corrosion rates of uncoated low carbon steel sample and painted low carbon steel sample, in 10 wt%  $\text{Ca(OH)}_2$  solution were determined. The corrosion rate of conducting polypyrrole coated low carbon steel sample was found to be 0.7 mpy which is about 2.85 times lower than that of uncoated steel sample. As compared to uncoated low carbon sample, polypyrrole coated low carbon steel sample exhibits higher impedance ( $Z_{\text{mod}}$ )  $\sim 1274 \text{ K}\Omega\text{-cm}^2$ , higher coating resistance ( $R_C$ )  $\sim 218 \text{ K}\Omega\text{-cm}^2$  and lower capacitance ( $CC$ )  $\sim 15.14 \text{ nF}$ , just after immersion in pore solution, without chloride contents just after immersion, in pore solution without chloride contents. Polypyrrole coated steel sample was able to protect low carbon steel for up to 240 hours of immersion in the pore solution containing no chlorides. However, at 0.25M NaCl and at higher concentrations, the self-healing ability of polypyrrole coating is no longer applicable to protect steel sample from corrosion. By applying statistical method, the error in the measured open circuit potential for uncoated steel was  $\pm 1 \text{ mV}$  and that of polypyrrole coated steel, was  $\pm 8 \text{ mV}$  around the mean value after 10 days of exposure. The error in the calculated polarization resistance for uncoated low carbon steel was 3% & that of polypyrrole coated low carbon steel was 1.52 % about the mean value. Findings in these investigations revealed possibility of using conducting polypyrrole based paint coating system for the protection of rebar in concrete.