

Article

# Initiation of chloride-induced corrosion of low carbon steel using *in situ* quantitative phase microscopy

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**Abstract:** The application of quantitative phase microscopy (QPM) techniques to study *in situ*, nanoscale dissolution kinetics during corrosion of steel rebar is very limited. Thus, this study uses a novel QPM technique, spectral modulation interferometry (SMI), to study *in situ* corrosion at the nanoscale in real time. With the SMI, high-quality quantitative kinetic data and analyses can be obtained on the fundamental micro-and nano-structural mechanisms and initiation of steel corrosion. With a novel 3D-printed fluid cell, both *in situ* nanoscale corrosion and electrochemical monitoring are performed simultaneously. The results from the electrochemical test showed that the performance of the fluid cell could yield repeatable results. Surface topography images acquired during corrosion using the SMI deduced that the techniques can be used to further assess corrosion initiation of low carbon steel samples.

**Keywords:** corrosion; steel rebar; quantitative phase microscopy; kinetics

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