

**Evaluating the Performance of Sulfonated Kraft Lignin Agent as Corrosion Inhibitor for Iron-Based Materials in Water Distribution Systems**

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**Abstract:** The effectiveness of sulfonated Kraft lignin (LS) as corrosion inhibition material of steel bar grade 60 (ASTM A615) in water distribution systems was studied using potentiodynamic polarization and electrochemical impedance methods. LS were evaluated primarily for iron-based materials in water distribution systems. The experiments were performed on different solutions which simulated internal conditions of water distribution pipelines without or with different corrosion inhibitors. Potentiodynamic polarization and electrochemical impedance were used to evaluate the iron-based material's corrosion resistance under these conditions, and linear polarization resistance (LPR) tests were used to compare the efficiency of the corrosion inhibitor. The potentiodynamic polarization studies showed a reduction in the pitting potential to more noble potential for protected corrosion cell. Consistently, the electrochemical impedance spectroscopy tests showed an increase in the corrosion resistance for iron-based material treated by sulfonated lignin. Based on the potentiodynamic polarization studies and electrochemical impedance spectroscopy tests, the LS optimal dosage was found to be 0.3-0.4 mg/L. The conducted polarization resistance tests showed a decrease in corrosion rates of LS treated iron. This study showed that LS provided increased protection for iron-based materials in water distribution pipelines by inhibiting corrosion.