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## The Preparation and Performance Study of a Phosphate-Free Corrosion/Scale Inhibitor

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### Author(s)

Defang Zeng, Wei Zhang

### ABSTRACT

By using acrylic acid copolymer, sodium citrate, hydrolyzed polymaleic anhydride (HPMA), corrosion inhibitor D and  $Zn^{2+}$  synergist as raw materials, a multi-component phosphate-free corrosion and scale inhibitor was developed. The performance of the composite phosphate-free corrosion and scale inhibitor was evaluated using the rotary hanging sheet corrosion test, the static scale inhibition test and the corrosion electrochemical test. And the surface morphology of the carbon steel was observed by scanning electronic microscope (SEM). Orthogonal experiment results indicated that the optimal mass ratios of amino acid:  $Zn^{2+}$  synergist: HPMA: corrosion inhibitor D: acrylic acid copolymer was 0.5:10:12:1:8. It was also observed that phosphate-free corrosion and scale inhibitor based on an anodic reaction through the electrochemical corrosion experiment, its annual corrosion rate and scale inhibition rate reached  $0.0176 \text{ mm} \cdot \text{a}^{-1}$  and 98.3%, respectively, showing excellent corrosion and scale inhibition performance.

### KEYWORDS

Phosphate-free corrosion/scale Inhibitor; Static Scale Inhibition Method; SEM; Electrochemical Corrosion

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