

## The adsorption and inhibition mechanism of 1-Phenyltetrazole-5-thiol for X70 steel corrosion in H<sub>2</sub>SO<sub>4</sub> medium

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Received: 5 August 2021 / Accepted: 18 September 2021 / Published: 10 November 2021

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This work aimed to develop a high-efficiency and reliable alternative for conventional and toxic corrosion inhibitor. A novel tetrazole derivative (1-Phenyltetrazole-5-thiol, PTT) that possessed excellent anti-corrosion capacity was exploited for the first time. Based on the traditional electrochemical investigation, morphological observation, and computer modeling, inhibition ability and adsorption type of PTT for X70 steel in 0.5 M H<sub>2</sub>SO<sub>4</sub> were varied. The electrochemical results showed that PTT was a mixed organic inhibitor, which could retard charge transfer impedance, and slowed down the corrosion rate of steel. Specifically, the highest inhibition efficiency was 95.1% when the added PTT dose was 2 mM. The adsorption model showed that the PTT film was formed via powerful physicochemical adsorption. As shown in theoretical calculations, the lower  $\Delta E$ , higher  $\mu$  values and  $E_{\text{binding}}$  value of PTT corresponded to supreme adsorption performance, which was also a manifestation of the PTT high-efficiency corrosion inhibition.

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**Keywords:** Corrosion inhibitor, Tetrazole derivative, Steel, Electrochemistry, Theoretical calculation

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