A Comprehensive Study on Surface Activity, Scale and Corrosion Inhibition Performance of $N^1, N^{1'}$ -(ethane-1, 2-diyl)bis(ethane-1, 2-diaminium) O, O -di(phenyl/ p -tolyl)phosphorodithioate

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The scale and corrosion inhibitors, $N^1, N^{1'}$ -(ethane-1, 2-diyl)bis(ethane-1, 2-diaminium) O, O -diphenylphosphorodithioate (I-inh) and $N^1, N^{1'}$ -(ethane-1, 2-diyl)bis(ethane-1, 2-diaminium) O, O -di- p -tolylphosphorodithioate (II-inh) have been successfully synthesized by the reaction of phenol/ p -methylphenol with phosphorus pentasulfide and triethylenetetramine in toluene solution. Meanwhile, the scale inhibition and corrosion inhibition performance of I-inh and II-inh were evaluated in this work. The corrosion inhibition evaluated by potentiodynamic polarization and weight loss and measurements show that I-inh and II-inh both are mixed-type effective corrosion inhibitors for Q235 steel (235QS) corrosion in H_2SO_4 solution. The scale inhibition efficiency and corrosion inhibition efficiency increased with I-inh and II-inh concentration increasing. Additionally, these two scale and corrosion inhibitors can also be used as excellent surfactants, the surface tension of I-inh and II-inh at critical micelle concentration were 37.64 mN m^{-1} ($17.14 \text{ mmol L}^{-1}$) and 35.40 mN m^{-1} ($18.03 \text{ mmol L}^{-1}$), respectively. The scale inhibition performance of I-inh against $CaCO_3$ and $CaSO_4$ scale are better than that of II-inh under the same conditions.

Keywords: Synthesis; Surface activity; Scale inhibition; Corrosion inhibition.

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