

## The Influence of Temperature on the Corrosion and Corrosion Inhibition of Steel in Hydrochloric Acid Solution: Thermodynamic Study

**Authors :** Fatimah Al-Hayazi, Ehteram. A. Noor, Aisha H. Moubaraki

**Abstract :** The inhibitive effect of *Securigera securidaca* seed extract (SSE) on mild steel corrosion in 1 M HCl solution has been studied by weight loss and electrochemical techniques at four different temperatures. All techniques studied provided data that the studied extract does well at all temperatures, and its inhibitory action increases with increasing its concentration. SEM images indicate thin-film formation on mild steel when corroded in solutions containing 1 g L<sup>-1</sup> of inhibitor either at low or high temperatures. The polarization studies showed that SSE acts as an anodic inhibitor. Both polarization and impedance techniques show an acceleration behaviour for SSE at concentrations  $\leq 0.1$  g L<sup>-1</sup> at all temperatures. At concentrations  $\geq 0.1$  g L<sup>-1</sup>, the efficiency of SSE is dramatically increased with increasing concentration, and its value does not change appreciably with increasing temperature. It was found that all adsorption data obeyed Temkin adsorption isotherm. Kinetic activation and thermodynamic adsorption parameters are evaluated and discussed. The results revealed an endothermic corrosion process with an associative activation mechanism, while a comprehensive adsorption mechanism for SSE on mild steel surfaces is suggested, in which both physical and chemical adsorption are involved in the adsorption process. A good correlation between inhibitor constituents and their inhibitory action was obtained.

**Keywords :** corrosion, inhibition of steel, hydrochloric acid, thermodynamic study

**Conference Title :** ICMDCS 2022 : International Conference on Materials Degradation and Corrosion Studies

**Conference Location :** Istanbul, Türkiye

**Conference Dates :** April 21-22, 2022