Study on Thermal Stability and Corrosion Inhibition Effect of [Ni(s-htde)](ClO₄)₂ for Q235 Steel in 1.0 M HCl

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Nickel (II) complexes of 5, 7, 7, 12, 14, 14-hexamethyl-1, 4, 8, 11-tetraazacyclotetradeca-4, 11-diene ([Ni(us-htde)](ClO₄)₂) and 5, 5, 7, 12, 12, 14-hexamethyl-1, 4, 8, 11-tetraazacyclotetradecane ([Ni(s-htde)](ClO₄)₂) are synthesized and confirmed by elemental analysis. Here, the thermal stability of the two nickel (II) complexes are investigated by TG/DSC technology. Moreover, the corrosion inhibition of [Ni(s-htde)](ClO₄)₂ in 1.0 M HCl is evaluated by weight loss method and potentiodynamic polarization measurement. The study results show that the thermal decomposition process of the [Ni(us-htde)](ClO₄)₂ and [Ni(s-htde)](ClO₄)₂ heated in N₂ and air atmospheres all proceeded in three steps, which is not affected by N₂ and air atmospheres. The thermal stability of the [Ni(s-htde)](ClO₄)₂ is better than [Ni(us-htde)](ClO₄)₂, which can be stable at the temperature below 283 °C and 270 °C in N₂ and air atmospheres. Meanwhile, the study results show that [Ni(s-htde)](ClO₄)₂ can act as an effective mixed-type corrosion inhibitor, and its adsorption on Q235 steel surface can be described by Langmuir isotherm, which belongs to physic- and chemisorption.

Keywords: Macrocyclic; Nickel complexes; Thermal stability; Decomposition; Atmospheres; Inhibitor.

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