Water-Soluble Calix [4] arenes as Inhibitors for the Corrosion of Aluminium in 2 M H₂SO₄ Solution

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Corrosion inhibition of aluminum in 2M H₂SO₄ solution in the presence of 5,11,17,23-tetrasulfocalix [4] arene (Calix-OH) and 5,11,17,23-tetrasulfo-25,27-bis (2-amino-ethoxy) calix [4] arene (Calix-NH₂) is examined using potentiodynamic polarization and electrochemical impedance spectroscopy measurements. Density function theory (DFT) calculations are used to investigate the relationship between the molecular structures of the studied compounds and their inhibition efficiencies. Results show that the presence of these two compounds in 2M H₂SO₄ solution inhibits the corrosion of aluminum without modifying the mechanism of the corrosion process as evidenced from shifting both the corrosion and the open circuit potentials of aluminum to more noble values as well as decreases its corrosion current density compared to its value in the blank solution. The maximum inhibition efficiency is found to be for Calix-NH₂. Moreover, the structure of aluminum/electrolyte interface in case of Calix-NH₂ behaves as more ideal capacitive rather than that in case of Calix-OH. The best fit adsorption isotherm is found to be Langmuir adsorption isotherm with physical nature. DFT calculations show that the presence of R-NH₂ group in Calix-NH₂ increases the electron density, so increases the electrostatic attraction with aluminum surface and consequently the protection efficiency

Keywords: Aluminum, Inhibition, Calixarene, DFT, EIS

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