Microwave Synthesis of Eco-friendly Nitrogen Doped Carbon Dots for the Corrosion Inhibition of Q235 Carbon Steel in 0.1 M HCl

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In this work, nitrogen doped carbon dots (NCDs) were prepared with citric acid monohydrate (CA·H₂O) and ethanolamine (EA) via microwave method. In combination with electrochemical techniques, weight loss and SEM, it is found that nitrogen doping in carbon dots effectively suppresses the corrosion of Q235 carbon steel in HCl solution owing to the presence of pyrrolic N in NCDs. Especially for NCDs (1:10), the optimum inhibition efficiency is about 89% after 1 h of immersion in 0.1 M HCl solution with 500 ppm of concentration. By further calculation, the ΔG_{ads}^0 value for NCDs (1:10) is -26.65 kJ·mol⁻¹, indicating the adsorption of NCDs on Q235 carbon steel surface involves both chemisorption and physisorption. In addition, NCDs still remain superior corrosion inhibition performance with the prolonged immersion time and ascending temperature.

Keywords: Microwave synthesis; NCDs; Corrosion inhibition; Q235 carbon steel.

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