

## Synthesis of boron doped carbon dots and their corrosion inhibition performance on carbon steel

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**Abstract** Carbon dots are an emerging zero dimensional carbon nanomaterial with advantages such as good bio-compatibility and low toxicity. Their nano properties give them excellent surface coverage and anti-corrosion activity, making them a potential green and efficient corrosion inhibitor. This study synthesized boron containing carbon dots (BCDs) with different morphologies using citric acid and boric acid as precursors and hydrothermal synthesis at 150 °C for different durations. BCDs were used as corrosion inhibitors for carbon steel under circulating water conditions, and the influence of carbon dot preparation conditions on their performance as Q235b carbon steel corrosion inhibitors was analyzed. The morphology and structure of BCDs were characterized by Fourier transform infrared spectroscopy, X-ray photoelectron spectroscopy, transmission electron microscopy, and other methods. The corrosion inhibition efficiency of BCDs under circulating water conditions was investigated by weight loss method. In addition, the corrosion inhibition mechanism of BCDs on Q235b carbon steel in circulating water was analyzed by electrochemical impedance spectroscopy, potentiodynamic polarization, and surface analysis techniques. The results indicate that the carbon dots prepared in this study have good corrosion inhibition efficiency on carbon steel in circulating water, and the inhibition efficiency can reach 87% when the BCDs concentration is 200mg/L. This study provides new ideas for the development of green and efficient new corrosion inhibitors.

**Keywords** Boron doped carbon dots; Corrosion inhibitor; Industrial circulating water; Electrochemical testing; Surface analysis