# Effect of dissolved oxygen concentration on stress corrosion behavior of 5383 aluminum alloy

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**Abstract** The lightweight of ships is an important development direction in the Marine field. With the proposal of carbon peaking and carbon neutrality，aluminum alloy will be more widely used in the field of ocean engineering. The aim of this study was to clarify the effect of dissolved oxygen concentration on the stress corrosion of 5383 aluminum alloy in the Marine environment. In this paper, the slow strain rate tensile test and electrochemical test of 5383 aluminum alloy in seawater with different dissolved oxygen concentrations (1mg/L, 3mg/L, 5mg/L, 7mg/L) were carried out.

The results show that the stress corrosion sensitivity of 5383 aluminum alloy decreases with the increase of dissolved oxygen concentration. This is because the higher the concentration of dissolved oxygen, the stronger the repair ability of the passivation film on the surface of the aluminum alloy. Under the protection of passivation film on the aluminum alloy surface, the fracture morphology changes from brittle fracture with low dissolved oxygen content to ductile fracture with high dissolved oxygen content.

The electrochemical test results of different dissolved oxygen concentrations show that the corrosion resistance of 5383 aluminum alloy decreases with the decrease of dissolved oxygen content. This is because 5383 aluminum alloy forms a passivation film with P-type semiconductor properties in seawater. The carrier Na decreased with the increase of dissolved oxygen content, and the flat-band potential Efb shifted positively with the increase of dissolved oxygen content. The more positive the flat-band potential and the smaller the carrier density, the fewer the defects and the better the protection performance of the passivated film. There are differences in passivation films under different dissolved oxygen conditions. This is because when the passivation film produces a small rupture, the high dissolved oxygen concentration makes the process of oxygen diffusion easier to achieve, which promotes the formation of a passivation film with fewer defects.

**Keywords** 5383 aluminum alloy, stress corrosion, Marine engineering, carbon peaking and carbon neutrality