

Tribological Behavior of Al-30%Al₂O₃-WS₂ Coating Fabricated by Low Pressure Cold Spray Technology

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Abstract To improve the wear resistance of Al coating, Al-Al₂O₃-WS₂ composite coatings were fabricated by Low pressure cold spray (LPCS) technology onto Q235 carbon steel. The effects of WS₂ addition on the tribological behavior of Al-30 vol%Al₂O₃-WS₂ coating with different WS₂ contents(mass fraction: 0.5%, 1%, 2%, 5%) were studied by tribological measurements and microstructural analysis. The wear mechanism of the composite coating under different conditions was elucidated. The wear mechanism of the composite coating under different conditions was elucidated. Under the dry friction, the wear weight loss of the coating is shown to decrease with the increasing content of WS₂ condition; the optimal amount of WS₂ is 5wt%, the wear loss of the coating is 200% lower than that of the Al-30%Al₂O₃ coating. The wear mechanism of the coating mainly includes the lubrication of WS₂ and the oxidation-adhesive wear and abrasive wear. Under the seawater conditions, the wear volume of coatings with different amount of WS₂ decreases with the increase of WS₂ content, which indicates that the increase of WS₂ content improves the wear resistance of the coating. The wear mechanism of the coating is mainly consists of WS₂ lubrication, corrosion wear caused by adhesive wear and a small amount of abrasive wear.

Keywords LPCS, Al-matrix composite coating, Al₂O₃, WS₂, Wear resistance

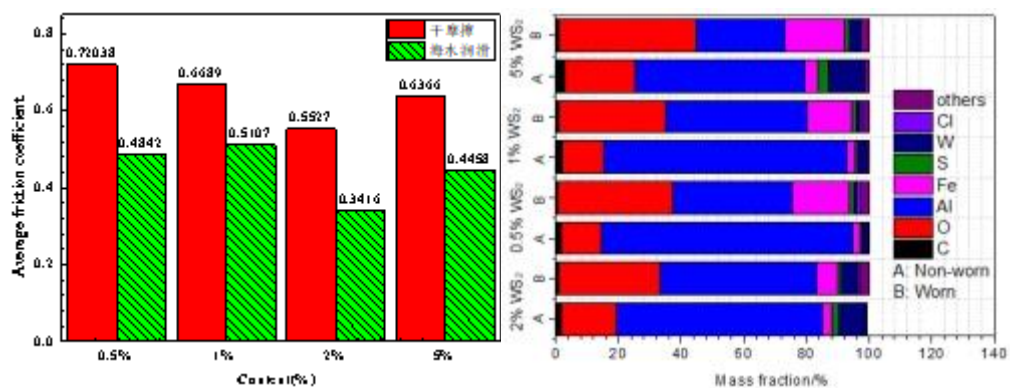


Figure 1 (a) COF of the Al-30 vol%Al₂O₃-WS₂ under dry/seawater conditions and (b) Element distributions of worn surface under seawater conditions