Effect of Current Density on Properties of Sol-Enhanced Ni–P– Al_2O_3 Composite Coating

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A Ni–P–(sol) Al_2O_3 coating was prepared on the surface of Q235 steel by direct-current electrodeposition. The coating surface morphology and structure were characterized by scanning electron microscopy and energy dispersive spectroscopy, respectively. The wear resistance of the coating was measured by a friction and wear machine. The coating hardness was measured by a microindentation instrument. The coating hardness was measured by a micrometer indentation meter. The corrosion resistance of the coating was tested by an electrochemical workstation. When the current density was 7 A/dm², the deposition rate of the Ni–P–(sol) Al_2O_3 composite coating was 83.9 μm/h, the surface morphology of the coating was smoothest and finest, and most alumina entered the coating and was distributed more evenly. With an increase in current density, the microhardness of the Ni–P–(sol) Al_2O_3 composite coating first increased and then decreased, and the maximum microhardness was 669.2HV. When the current density was 7 A/dm², the coating had the best corrosion resistance and wear resistance.

Keywords: current density, electrodeposition, sol reinforced composite coating, corrosion resistance, wear resistance

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