Improving the Properties of Ni-ZrO₂ Composite Coatings by Sol-Enhanced Electroplating

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doi: 10.20964/2018.11.97

Received: 15 July 2018 / Accepted: 6 September 2018 / Published: 1 October 2018

ZrO₂ powder has been used as a second phase in metal coatings which can significantly improve the wear resistance of composite coatings. By using newly developed sol-enhanced electroplating method, Ni-ZrO₂ composite coating has been deposited on mild steel samples. The microstructure, hardness and wear property of sol-enhanced electroplated a Ni-ZrO₂ composite coatings with different ZrO₂ sol concentration were analyzed using SEM, XRD, micro-hardness and wear tests. The effect of ZrO₂ sol concentration on the surface morphology, microstructure and mechanical property of electroplated coatings was discussed and compared with Ni-ZrO₂ composite coatings prepared by adding ZrO₂ powder. It was found that incorporation of ZrO₂ sol improves the mechanical property of Ni coatings in composite coatings. Compared with the traditional ZrO₂ powder method, Sol-enhanced method has better enhancement effect. The mechanical properties of Ni-ZrO₂ coatings reach the optimum value when the ZrO₂ sol concentration is 15 ml/L.

Keywords: mechanical property, Ni-ZrO₂ composite coatings, sol-enhanced electroplating

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