Effect of the Composition and the Thermal Treatment on Corrosion Resistance of WC-Co-Al₂O₃ Ceramic Coatings

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The effect of the composition and thermal treatment of WC-Co-Al₂O₃ coatings (without and with of Al₂O₃) on the C45 mild steel surface on the corrosion resistance were examined. The aggressive acidic chloride (1.2 M Cl⁻) environment was used for the testing of corrosion resistance of the materials. The ceramic coatings (CC) on the steel surfaces were deposited by a electrospark (ESD) technique. The content of aluminum oxide (Al₂O₃) was varied between 5 and 15 wt.%. However, thermal treatment of the tested coatings were done for temperature which was changed between 25 and 1200 °C. The anti-corrosion properties of the coatings without and after heat treatment were mainly investigated by electrochemical methods. Moreover, the scanning electron microscope (SEM) was employed for the observation the surface of materials. It was found that the structure of coatings were depended from the composition of electrospark electrodes. However, the corrosion rate of the substrate decreases about six times after applying the WC-5Co-15Al₂O₃ coating. Unfortunately, after thermal treatment at 800 °C the WC-Co and WC-Co-Al₂O₃ ceramic coatings lose their anti-corrosion properties. Ceramic coatings lose their anti-corrosive properties.

Keywords: Mild steel; WC-Co-Al₂O₃ coating; Ceramic coating; Electrospark deposition; Corrosion rate

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