Electrochemical Methods for Obtaining Thin Films of the Refractory Metal Carbides in Molten Salts

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doi: 10.20964/2017.06.52

Received: 27 February 2017 / Accepted: 23 April 2017 / Published: 12 May 2017

Synthesis of Cr_7C_3 , NbC and TaC coatings on the surface of carbon steels and carbon fibers was carried out using currentless transfer. The corrosion resistance of the Cr_7C_3 , NbC and TaC carbides coatings was studied in concentrated HCl, H_2SO_4 and H_3PO_4 acids. The wear resistance was evaluated by the sample mass loss. Due to the high wear and corrosion resistance Cr_7C_3 , NbC and TaC coatings on carbon steels can be applied in aggressive medium with the abrasive wear. Coatings of NbC or TaC on carbon fibers make better the fiber's mechanical resistance. Mo_2C coatings were obtained on Mo substrate at the temperature 1123 K by electrochemical synthesis in $\text{NaCl-KCl-Li}_2\text{CO}_3\text{-Na}_2\text{MoO}_4$. The $\text{Mo}_2\text{C/Mo}$ composition was tested as a catalyst for the water-gas shift reaction. The steady-state reaction rates for the $\text{Mo}_2\text{C/Mo}$ composition were higher than those for the bulk Mo_2C and commercial $\text{Cu/ZnO/Al}_2\text{O}_3$ catalysts over in the temperature range explored.

Keywords: Molten salts; Coatings; Refractory metals carbides; Electrochemical synthesis; Currentless transfer; Corrosion and Wear Resistance; Catalytic activity

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