
Comparison of electrochemical behaviour of TiN and TiCN deposited on XC48 steel substrates by magnetron sputtering.

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Abstract

Many transition metal nitride and carbide coatings, especially TiN, TiCN, have achieved wide application in surface engineering. This is because these coatings exhibit many extraordinary properties, such as high hardness, good wear and high corrosion resistance, low friction and good electrical and thermal conductivity.

A range of different chemical compositions of TiXNY and TiNZ coatings were deposited by a magnetron sputter ion plating technique onto XC48 steel substrates. Scanning electron microscope (SEM) and optical spectroscopy (OS) techniques were used to analyze and characterize chemically the TiCN and TiN layers.

The corrosion protection of the coatings were established by the electrochemical measurements in the NaCl at 3.5% solution. The highest corrosion resistance of coated was found for the TiCN and the lowest one for TiN. Potentiodynamic tests performed in 3.5% NaCl showed that an increasing carbon content in the coating decreased the corrosion resistance. The influence of structure and microporosity of coatings, obtained by PVD method, on corrosion resistance was discussed.

Finally, it was found that TiCN and TiN coatings increased the corrosion potential of the XC48 steel in 3.5% NaCl solution at room temperature.

Keywords: Corrosion behavior, Type XC48 steel, TiC and TiCN coatings, magnetron sputter.

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