

## **Abstract**

### **Corrosion behavior of AISI 4140 surface coated by TiAlN**

This research aims to study the corrosion behavior of uncoated and TiAlN coated on AISI 4140 steel. The AISI 4140 steel samples were coated by TiAlN with various thicknesses, i.e., 250 nm (TiAlN-250nm), 500 nm (TiAlN-500nm) and 750 nm (TiAlN-750nm). After that samples surface was characterized by Field Emission Scanning Electron Microscope (FE-SEM) with energy dispersive X-ray analysis (EDX) and X-ray diffraction (XRD). The corrosion behavior of the uncoated and coated samples were studied by an electrochemical technique in 3.5 wt% NaCl solution at pH value of 2, 7 and 10 at room temperature. After electrochemical testing, samples surface was characterized by scanning electron microscopy (SEM) with energy dispersive X-ray analysis (EDX) and X-ray photoemission electron microscopy (X-PEEM) with X-ray absorption spectroscopy (XAS). The results indicated that the TiAlN coated samples yielded better corrosion resistance than the uncoated samples at all pHs. Increasing thickness of TiAlN resulted in better corrosion resistance because the TiAlN coated samples had stable passive film. The results from corroded surface characterized by X-PEEM showed that there was a spalling of the film from metal substrate in particular for the thin coated sample. Moreover, it was found that the TiAlN coated samples had less corroded surface and corrosion product than those of the uncoated samples.