Thesis Title	Characterization of Titanium Nitride Film Coating on Stainless Steel
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Abstract

The characteristics of titanium nitride (TiN) film coating on stainless steel substrates were studied under various processing conditions e.g. different the nitrogen flow rates and substrate temperatures. The TiN film was produced by reactive magnetron sputtering process under mixed gases pressure of argon and nitrogen with the stainless steel 304 subtrates. X-ray diffraction was used to verify the TiN crystalline structure. The diffraction patterns of Ti_2N (101) and TiN (111) phases at $2\theta = 34.5^{\circ}$ and 36.1°, respectively, were found when the nitrogen flow rate was 3.38 sccm. It was obserbed that at the nitrogen flow rates of 3.84 and 7.80 sccm only the TiN (111) peak was observed at $2\theta = 36.1^{\circ}$. Scanning electron microscopy examination indicated that the film structure was more uniform and denser for higher substrate temperature. At 250°C, there were nonuniform film structures with some grooves and a big hump of titanium nitride film. Hardness measurements were performed by a Nano Inderter model XP to determine the mechanical properties of the films. The results showed that the surface hardness of stainless steel which was coated with this film was higher. The film hardness at 50 nanometer depth was higher than that at 100 nanometer for film thickness of about 1 micron. The experiment result showed the highest hardness was obtained when nitrogen flow rate was 7.80 sccm and titanium nitride film was TiN-phase.

Keywords : characterization / reactive magnetron sputtering / titanium nitride /nitrogen flow rate/ substrate temperature / nano-hardness