

## Nanocrystalline nickel deposition on the titanium alloys using high solution flow velocity

### Abstract :

An innovative process has been developed for electroplating of nickel on titanium surface using fast solution flow technique. Nickel was directly deposited on a titanium alloy without using any pre-treatment process. Level of adhesion was determined using quantitative peel test and characterization of the deposition was performed by scanning electron microscopy. Results showed that the rate of nickel deposition at 60 C was higher than that of the rate of nickel deposition at 40 C. Moreover, Watts solution provided higher rate of nickel deposition compared to the sulfate-based nickel solution. The rate of deposition increased with increasing the solution flow velocity from 1.5 to 3 m/s and raising current density from  $0.4 \times 10^4$  to  $1.6 \times 10^4$  A/m<sup>2</sup> for both solution baths. Adhesion test indicated good level of adhesion between the deposited nickel and titanium surface. The bonding toughness increased to 4 J/m<sup>2</sup> for  $1.2 \times 10^4$  A/m<sup>2</sup> as a result of higher deposition rate. However, the mechanism responsible for the coating process was discussed in detail.