

Wear and Corrosion Resistance of Ti/TiSiN and Ti/DLC Based Nanostructured Coatings Prepared by Cathodic Arc Deposition

N. Vattanaprateep^{a,*}, N. Panich^b and P. Surin^a

^aDepartment of Advanced Manufacturing Technology, Faculty of Engineering, Pathumwan Institute of Technology, Bangkok 10330, Thailand

^bDepartment of Industrial Engineering, Faculty of Engineering, Rajapark Institute, Bangkok 10310, Thailand

*Corresponding Author: E-mail: nuntapolv@yahoo.com

Keywords: TiSiN Coatings, DLC Coatings, Cathodic Arc Deposition, Hardness, Corrosion

Wear, together with corrosion normally results in early failure of components during applications. To reduce the vast economic losses, coatings have been used to improve the reliability and service performance of the engineering components. Past studies have shown multilayer coatings exhibit better properties than single-phase layer, thus enhancing the lifetimes of components. This study investigated feasibility of the application of multilayer Ti/TiSiN and Ti/DLC coatings as means of protection. Since Ti/TiSiN and Ti/DLC coatings have low friction coefficient, this involves evaluation of the wear and corrosion resistance of the coatings. The coatings were first deposited on tungsten carbide substrates by cathodic arc technique. The morphology, orientation and mechanical properties of deposited coated samples were then characterized and evaluated. The samples were tested in laboratory environment to assess their wear and corrosion resistance. It can be seen that Ti/TiSiN demonstrates highest hardness of 40.9 GPa and Young's modulus of 362 GPa. Furthermore Ti/DLC coatings show the lowest wear rate of 4.5×10^{-7} mm³/N.m and possess the highest corrosion protective efficiency of 96.91%. It was concluded that the Ti/TiSiN and Ti/DLC coatings to be used as protective coating can improve the overall service performance and life span of the components. This study also found that the wear and corrosion resistance of the coated samples are highly related to mechanical properties and microstructure of the coatings.