

Mechanical properties and bio-tribological performance of PVD (Ta/ZrN)_n multilayer coatings on UHMWPE in bovine serum lubrication

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Abstract: This work investigated the tribological performance of (Ta/ZrN)_n multilayer coatings against ultrahigh molecular weight polyethylene (UHMWPE) material. Three multilayer coatings with different designs were deposited on Ti-6Al-4V substrate and subjected to wear testing under lubrication of diluted bovine calf serum. The results revealed an improvement in wear resistance of (Ta/ZrN) multilayer coatings and low coefficient of friction under an applied load of 1 N. High hardness, excellent biotribological properties, and low residual stresses were obtained in the multilayer coating with the thinnest ZrN as the topmost layer of 100 nm. This work demonstrates that Ta/ZrN multilayers can be promising coatings for prosthesis applications.

Keywords : PVD coating, Ta/ZrN, UHMWPE, wear