

KN0500

Microstructural, Mechanical and Tribological Properties of Thick and Ultra-thick, Nanocomposite Coatings

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In this lecture, the microstructural, mechanical and tribological properties of thick and ultra-thick (560 micrometer), TiSiCN-based nanocomposite coatings developed at Southwest Research Institute will be review. These coatings have been prepared using a plasma enhanced magnetron sputtering (PEMS) process, in which a global plasma, in addition to the magnetron plasma, is generated using filament thermionic emission. The global plasma results in an ion flux to the substrate up to 20 times higher than the magnetron plasma alone. Thus the resultant coating has a very dense structure with excellent adhesion and a low stress, allowing the formation of the ultra-thick coatings. Using SEM/EDS, TEM, nanoindentation, scratch testing, erosion testing, abrasion testing and sliding wear testing techniques, these coatings have been characterized. They exhibited a microstructure composed of TiCN nanocrystalline (4-7 nm) in a matrix of SiCN with the hardness up to 4600HV and high values of H/E^* and H^3/E^{*2} . These coatings showed very high erosion, abrasion and sliding wear resistance. They have been applied to aerospace, oil and gas industry and automotive. Some practical examples will be given.

Keywords

Nanocomposite
Ultrathick
TiSiCN
superhard
erosion resistant