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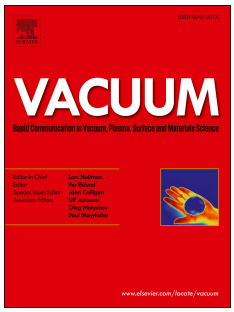

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Structure, mechanical and friction behavior of laminar Ti-incorporated Al_2O_3 thermal control films deposited on polyethylene terephthalate flexible substrates

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Abstract

Nano-multilayered Ti-Al_2O_3 films with different Ti layer thicknesses were fabricated on polyethylene terephthalate flexible substrates by roll to roll magnetron sputtering. The morphologies and structure of the multilayer films were investigated by scanning electron microscopy and X-ray diffraction. Multilayer films show dense and coherent epitaxial growth due to the mutual growth-promoting effect. Bruker tester, nano-indenter and tribometer were used to examine the adhesion strength, mechanical and tribological properties of Ti-Al_2O_3 multilayer films. Results indicate that multilayer films can be deformed together with PET substrate and withstand the larger strain without cracking. The mean value of adhesion strength of the multilayer films obtained from the scratch tests are in the range of 14.5-16.3 mN. The multilayer films with Ti layer thickness of 8.3 nm have the highest hardness of 21.3GPa, lowest friction coefficient of 0.32 and lowest wear rate of 2.46×10^{-6} mm^3/Nm.