

Structural and chemical study of interfaces in TiAlN/TiAl multilayers

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Nanocrystalline metallic nitride coatings are currently used for their outstanding properties: hardness, good wear resistance, thermal stability by improving oxidation resistance, which make them attractive as protective coatings. To improve fracture toughness while maintaining a high hardness, TiAl/TiAlN metal/nitride multilayered coatings, were deposited by magnetron reactive sputtering technique named Reactive Gas Pulsing Process (RGPP) [1], allowing to modulate the layer's composition by pulsing the nitrogen reactive gas. This technique allow to take advantage of the properties of the nitride (covalent hard material), the metal alloy (ductile layer) [2] and the crack resistance of the interfaces [3]. Multilayered films with different period in a range of 4 to 50nm, were deposited by RGPP, for a total coating of 1500nm.

The role of the composition, thicknesses of the two nano-layers as well as the interfaces, on the mechanical behavior of the film, is crucial that is why the study will focus on the chemistry and structural properties at the atomic scale before and after nanoindentation tests. This will be studied by combining Energy Dispersive Spectroscopy and Electron Energy Loss Spectroscopy as well as conventional Transmission Electron Microscopy, all along the stack.

References:

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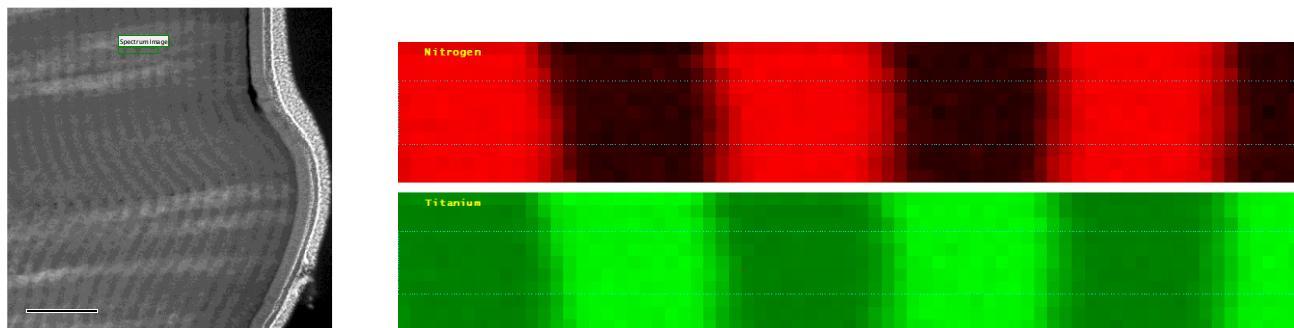


Figure 1. ADF STEM image and N and Ti mapping of a selected area.