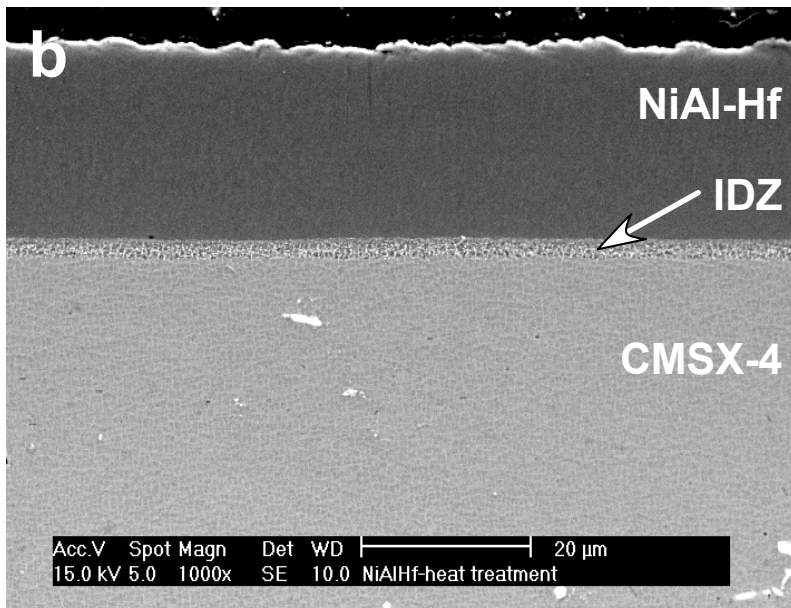


Fundamental Micromechanics and Materials Dynamics of Thermal Barrier Coating Systems Containing Multiple Layers

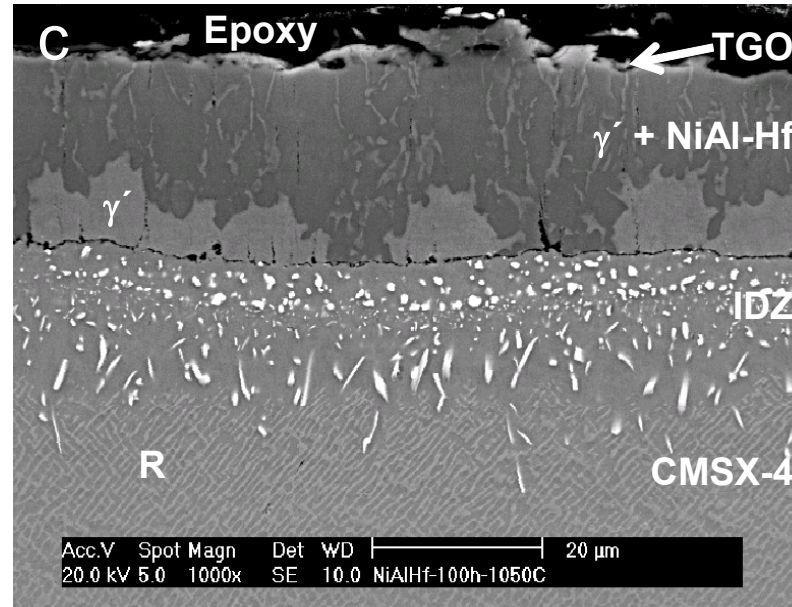
Mark L. Weaver, The University of Alabama Tuscaloosa, DMR Award #9984899

NiAl-Hf Bond Coats

- NiAl-Hf alloys show potential for use as new bond coats in thermal barrier coating systems.
- Adhesion of NiAl-0.1Hf (at.%) coatings to CMSX-4 is increased by Ar annealing at 1000°C/1h due to the formation of an interdiffusion zone (Fig. 1).

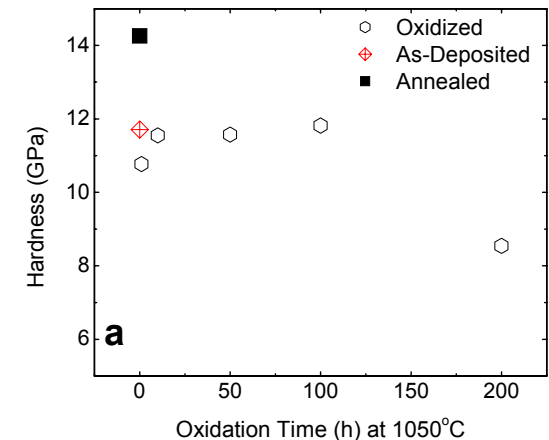


▲ **Figure 1.** Microstructure of NiAl-0.1Hf coating. (a) SEM micrograph and (b) TEM micrograph.



▲ **Figure 2.** Microstructure of NiAl-0.1Hf after 100h oxidation at 1050°C.

- Mechanical properties (hardness and modulus) are altered during oxidation by microstructural changes and grain growth (Fig. 3).



- Coating transforms from β -NiAl to γ' -Ni₃Al during oxidation due to inter-diffusion with the substrate (Fig. 2).