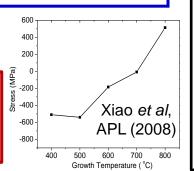
Grain Boundary Induced Stresses in Nanocrystalline Ceramic Coatings and Thin Films

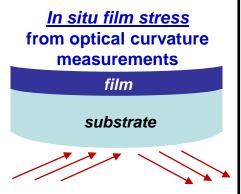
Brian W. Sheldon, Janet Rankin (Brown University), Barbara Walden (Trinity College)

Nanocrystalline Diamond

Stress During
CVD Growth:

Large Impact of Grain Bdry Chemistry & Structure

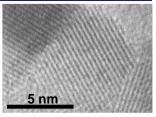




Non-Stoichiometric Oxides

Stress Due to O
Variations in CeO_{2-X}

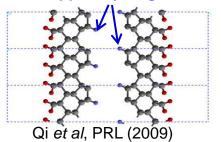
Grain Bdry Contributions Dominate Stress

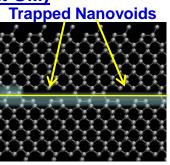


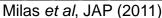
Nanocrystalline CeO_{2-X} deposited from Ce(thd)₄

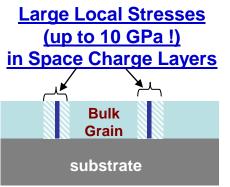
DFT Calculations (w. Yue Qi at GM)

Trapped Hydrogen





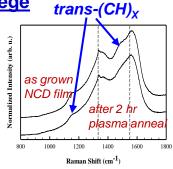




Sheldon, PRL (2011)

Trinity College

- faculty involved in research (Raman)
- Trinity undergrads working at Brown



Broader Impacts

General Motors

- interest in low friction NCD coatings
- DFT (see above)
- use of GM facilities

<u>Institute National Polytechnique –</u> Toulouse (France)

- H and OH induced stresses in protective alumina coatings (on Ti alloys)
 - Soni et al, ECS Trans (2010)
- extensive student and faculty exchanges

DMR-Award 0805172