**Martensite Rearrangement in Zirconia Based Ceramics through Micropillar Compression**

The chemical composition of zirconia based ceramics can be altered to increase the interphase compatibility between its high temperature tetragonal phase (austenite) and low temperature monoclinic phase (martensite), exhibiting a high potential for Shape Memory Effects (SME). EBSD and TEM characterization confirms the existence of single orientation tetragonal phase grains and twinned monoclinic phase grains in the studied samples. Uniaxial compression tests on both 1.3μm and 600nm diameter single crystalline pillars in samples of three different compositions at much below their transformation temperatures show clear signs of martensite rearrangement, and the full circle one-way SME was recovered through two rounds of heat treatment. The effects of temperature as well as composition on the martensite stress strain response are also studied. To understand the Shape Memory properties of these zirconia based ceramics in their polycrystalline state, compression tests on bi-crystalline pillars were also carried out, showing a relation between catastrophic failure and the orientation of the grain boundary.