

## Description of Additional Supplementary Files

File Name: Supplementary Movie 1

Description: A video showing a typical in-situ microcompression test on the flash sintered 3YSZ at 250 C performed in SEM. Note that the pillar can accommodate true strain as much as 8% before it experiences catastrophic failure.

File Name: Supplementary Movie 2

Description: A video showing in-situ microcompression test on the flash sintered 3YSZ at 400o C in SEM. Note that 400o C is a demarcation temperature where a new inelastic deformation mechanism begins to operate. Early crack occurrence at low strain due to the lack of transformation-induced toughening was observed.

File Name: Supplementary Movie 3

Description: A video showing in-situ microcompression test on the flash-sintered 3YSZ performed at 600o C in SEM. Note that the pillar can accommodate 15% of true strain at the test temperature without catastrophic failure.