IN-FLASH MEASUREMENTS OF ELASTIC CONSTANTS

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Key Words: Flash sintering, elastic modulus, single crystal elastic constants, ESO, X-ray diffraction

Flash sintering is a novel densification technique where a green ceramic body is densified at remarkably lower furnace temperature and in lesser time. Recent studies have shown that significant softening has been observed by in situ measurements of elastic modulus during flash sintering especially in zirconia. High concentrations of Frenkel pairs have been proposed to create this behavior in the material. Understanding microscopic properties of the materials require the fundamentals of elasticity. The complete elastic tensor of a single crystal is also important as they find use in many applications such as sensors, lasers, microelectronic semiconductor devices and jet engine turbine blades. The elastic tensor gives a complete description of a single crystal response to external forces within the elastic limit which is useful for the design of components. Extraction of the full elastic tensor is cumbersome. There is no established methodology to extract the entire elastic tensor experimentally for all the crystal structures. Hence, due to the necessity of an easy to access lab technology and an established methodology to measure full elastic constants, a custom-built multiaxial tension/compression machine equipped with X-ray diffractometer is used estimate single crystal elastic constants (SECs) from diffraction elastic constants (DECs) from polycrystalline materials. The SECs of an entropy stabilized oxide (ESO) are calculated. Further proof-of-concept experiments are planned to carry out for the structural characterization of flash sintered cubic zirconia to observe the effect of flash on the complete elastic tensor.