

Electric Field Manipulation of Matter via Synchrotron Radiation

by

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#### Flash Sintering (FS), a relatively new method, densifies ceramic powders, in seconds, at very low temperatures. A non-equilibrium rise in current, under applied electric field, is used to densify matter. EDXRD Temperature Calibration utilizes white energy dispersive x-ray diffraction (EDXRD) from a synchrotron source to track the lattice expansion of the ceramic during FS. In this presentation, studies on the following materials will be discussed: ZnO, TiO2, CeO2 and BiFeO3 oxides and B4C , TiB2 ZrB2 and BN nonoxides. This In-Situ investigation analysis of mechanisms at the onset of FS, the cause of enhanced sintering kinetics during FS and applied temperatures for each theory will be presented. New ways of performing FS experiments on ZnO by ramping the current linearly and by AC power supply, microstructural inhomogeneity, grain growth, and other physicalproperties will be also shown. FS of BiFeO3 is a homogeneous process at exceptionally low temperatures (350 0C < Tc) will be described as well as the excellent dielectric properties that are discovered.