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High-pressure X-ray diffraction study of the giant dielectric constant material $CaCu_3Ti_4O_{12}$: evidence of stiff grain surface YANZHANG MA, Department of Mechanical Engineering, Texas Tech University, Lubbock, TX 79409, JIANJUN LIU, Department of Physics University of Nebraska at Omaha, Omaha, Nebraska 68182-0266, CHUNXIAO GAO, National Laboratory of Superhard Materials, Jilin University, Changchun, China 130012, ALLEN D. WHITE, Department of Mechanical Engineering, Texas Tech University, Lubbock, TX 79409, W. N. MEI, Department of Physics University of Nebraska at Omaha, Omaha, Nebraska 68182-0266, JAHAN RASTY, Department of Mechanical Engineering, Texas Tech University, Lubbock, TX 79409 — We measured the high-pressure X-ray diffraction of the giant dielectric constant material $CaCu_3Ti_4O_{12}$ (CCTO) under both hydrostatic and uniaxial compressions. We found that the cubic structure of CCTO is stable up to 57 GPa. Nevertheless we observed CCTO has unusual compression behaviors under hydrostatic pressure. Specifically, the volume reduction is less than that under uniaxial compression below 25 GPa, above it the volume reduction starts to approach and finally reach the same value as that under the uniaxial compression at about 30 GPa. We explained these remarkable phenomena by using the model that the samples are composed of grains that have shells stiffer than the cores.

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