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Anisotropic elastic-plastic transition of MgO under shock compression XUN LIU, KENICHI OGATA, Shock Wave and Condensed Matter Research Center, Kumamoto University, XIANMING ZHOU, National Key Laboratory of shock Wave and Detonation Physics, Institute of Fluid Physics, WILLIAMS J. NELLIS, Department of Physics, Harvard University, TOSHIMORI SEKINE, Department of Earth and Planetary Systems Science, Hiroshima University, TSUMOTO MASHIMO, Shock Wave and Condensed Matter Research Center, Kumamoto University — The failure of brittle materials under uniaxial shock-loading has been the subject of many discussions. But the physical explanation of the yield behavior remains poorly understood. In this study, we focus on the elastic-plastic transition of MgO single crystal, which is the simplest metal oxide with a cubic structure, and can be studied as a prototype. Otherwise, the equation of state (EOS) of MgO is also a key problem because of its geophysical importance and its application as pressure scale in static compression experiments. The interface particle velocity profile between MgO single crystal and LiF window was measured by a VISAR system. The Hugoniot elastic limits (HELs) along <100> direction are measured to be around 4.2 GPa, and keep constant under different loading pressure, while the HELs along <110> direction is much higher, with a minimum value of 10GPa and increase with final pressure. When shock along <100> direction, MgO suffers a catastrophically loss of shear strength, while along <110> direction, the deformation is more close to ideal elastic-plastic change. These differences indicate different deformation mechanism along different loading direction, which will be discussed later.

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