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Hugoniot temperature measurements of Sapphire using laser-induced decaying shocks TAKAYOSHI SANO, NORIMASA OZAKI, Osaka University, TOMOAKI KIMURA, Ehime University, KOHEI MIYANISHI, RYOSUKE KODAMA, Osaka University, TAKU TSUCHIYA, Ehime University, TATSUHIRO SAKAIYA, KEISUKE SHIGEMORI, Osaka University, TOSHIHIKO KADONO, University of Occupational and Environmental Health, YOICHIRO HIRONAKA, Osaka University, MASAHIRO IKOMA, University of Tokyo, TAKUO OKUCHI, Okayama University, TOSHIMORI SEKINE, Hiroshima University — Properties of Sapphire at TPa regime are of great scientific interest. The EOS and conductivity of Sapphire at this condition are crucial to understand the interior structure of super-Earth exoplanets. Metallic transition of Sapphire is suggested to be similar to that of liquid Hydrogen (Mott-like transition). Then, we performed laser shock experiments on the Hugoniot measurements of Sapphire by GEKKO system at Osaka University. Taking advantage of decaying shock feature, Hugoniot temperature and optical reflectivity were measured in a wide range of the pressure. The reflectivity increases gradually from around 0.6 TPa and reaches 15% at 1.3 TPa. The increase of the internal energy is observed at this regime, and the Hugoniot curve deviates from the isotherm. Obtained Hugoniot temperature shows little increase between 0.6 to 1 TPa. This trend cannot be seen in the SESAME EOS model and could be related to the dissociation of Sapphire. We focus on this transition process, and investigate it in detail with the help of ab initio molecular dynamics simulations.

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