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Shockless compression of silicon using high-power laser¹ NORIMASA OZAKI, TOMOKAZU SANO, RYOSUKE KODAMA, TOMOAKI KIMURA, AKIO HIROSE, Graduate School of Engineering, Osaka University, MICHEL KOENIG, LULI, Ecole Polytechnique, KEISUKE SHIGEMORI, DAIGO ICHINOSE, Institute of Laser Engineering, Osaka University — Shockless compression experiments for single-crystal silicon were performed using a high-power laser. Silicon is a typical interesting material exhibiting polymorphism, and the phase diagram is not understood well. For instance, Si is predicted to undergo a metallization transformation under compression. A polyimide reservoir target (75 μ m) was irradiated with the GEKKO/HIPER laser ($\lambda = 0.35 \ \mu m$), the reservoir plasma expanding to a vacuum gap (~ 200 μ m) and colliding with a Si sample (20-30 μ m). The rearsurface of Si was observed with 2-channel velocity interferometer system (VISARs) and a streaked optical pyrometer. The change of reflectivity from the VISARs may indicate phase transitions under the continuous quasi-isentropic compression. We also for the first time recovered the Si target shocklessly compressed by high-power laser. The structure of the recovered sample was analyzed using a large synchrotron radiation facility.

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