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Electron microscopic observation in femtosecond laser-driven shock compressed silicon MASASHI TSUJINO, TOMOKAZU SANO, KAZUTO ARAKAWA, TOMOYUKI TERAI, NORIMASA OZAKI, HIROTATO MORI, TOMOYUKI KAKESHITA, RYOSUKE KODAMA, AKIO HIROSE, Osaka University, OSAMI SAKATA, SPring-8, MASAYUKI OKOSHI, NARUMI INOUE, National Defense Academy of Japan, KOJIRO KOBAYASHI, The Wakasa Wan Energy Research Center — We observed microstructure in a femtosecond laser-driven shock compressed silicon using transmission electron microscope. A high-pressure phase was observed in the region where dense defects exist in diamond type structures with the dark field image using the spot obtained diffraction from the high-pressure phase theoretically. The high-pressure phase observed in these experiments is β-Sn type structure which is stable under the pressure of around 11 to 13 GPa. The phase has never remained and transforms to not diamond type structure but metastable structures after static and conventional dynamic compressions. We also confirmed that the lattice defects induced by the femtosecond laser-driven shock were denser than the statically compressed silicon using diamond anvil cell. We suggest that the dense defects play an important role in the quenching of the high-pressure phase. We will address a mechanism of the quenching of high-pressure phases of silicon using the femtosecond laser-driven shock wave.

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