

Abstract Submitted
for the SHOCK13 Meeting of
The American Physical Society

Growth of rectangular hollow tube single crystals with rutile-type structure in supercritical fluids KEN NIWA, TOMOHARU TOKUNAGA, MASASHI HASEGAWA, Nagoya University — Super critical fluid is known as a suitable solvent in the dissolution and extraction process, due to its extreme high solubility and reactivity. On the other hand, further experimental approaches using supercritical fluid would offer new insights, especially in the field of novel material synthesis and crystal growth. We here report on the successful growth of single crystals with the rutile-type structure (MO_2 ; $M = \text{Ti, Si, Ge and Sn}$) in the supercritical fluids (water or oxygen) by using laser heated diamond-anvil cell at above 5 GPa. The resultant product showed the rectangular hollow tube with several tens of microns in length and the wall thickness of less than 500 nm. TEM analyses demonstrated that this rectangular hollow tube single crystal is surrounded by the (110) face and grown along the [001] direction. The preferential growth of (110) face is consistent with the lowest surface energy of (110) in the rutile-type structure. In addition, the rapid cooling rate of LHDAC and the high-solubility of oxides into the supercritical fluids also play an important role for the formation of the rectangular hollow tube. The details of the experiments will be discussed in the presentation.

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Date submitted: 22 Feb 2013

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