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Supercritical CO₂-assisted Phase Transformation from Orthorhombic to Hexagonal MoO₃

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Abstract

The metastable hexagonal phase of molybdenum oxide (h-MoO₃) have drawn much attention due to the novel one-dimensional tunnel structure and enhanced properties in physical, optical, chemical and electronic fields. Most of the researchers focused on the hydrothermal reaction to obtain h-MoO₃ using NH₄⁺, Na⁺ or K⁺ ion as the structure-directing agents and stabilizer of the h-MoO₃, which will definitely hinder the further application of h-MoO₃. In this work, for the first time, we demonstrate a novel top-down method to obtain metastable h-MoO₃ via a topotactic phase transformation with the assistance of supercritical carbon dioxide (SC CO₂). Our study indicates that this successful phase transformation is due to distortion of MoO₆ octahedra units that might be induced by the surface tension change.

Key words: molybdenum oxide, supercritical CO₂, phase transformation, hexagonal phase, crystal structure

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