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Ab-initio synthesis and TEM confirmation of antigorite in the system MgO-SiO₂-H₂O

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ABSTRACT

For the first time, chemically pure, nearly single-phase antigorite, Mg₄₈Si₃₄O₈₅(OH)₆₂, was synthesized directly without using seeds. Starting material was a stoichiometric mixture of previously synthesized talc and brucite. Synthesis conditions were 50 kbar, 500 °C, and 120 h. TEM studies show that the dominant wavelength for the structural modulation of antigorite is about 4.5 nm, which corresponds to $m = 17$ in the general antigorite formula $M_{3m-1}T_{2m}O_{5m}(OH)_{4m-6}$ and thus to the structure of most natural antigorites. Selected-area electron diffraction patterns of single crystals exhibit the $hk0$ reciprocal net diagnostic of antigorite.