Stabilization of high-pressure phase of CdO by nanoparticle formation in $Cd_xZn_{1-x}O$ thin films

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We have discussed the observation of the high-pressure B2 phase in CdO nanoparticles obtained by temperature induced phase transition from the CdO B1 phase in $Cd_xZn_{1-x}O$ films grown on a Si substrate. The structural transformation occurs upon annealing the film from 700 to 900℃ and is monitored by X-ray diffraction and Raman spectroscopy. Concomitantly, willemite Zn_2SiO_4 nanoparticles form at the $Cd_xZn_{1-x}O$/Si interface and are evidenced using scanning transmission electron microscopy, X-ray absorption and photoelectron spectroscopies. The presence of Zn_2SiO_4 at the film-substrate interface is assumed to exert locally a high pressure on the CdO crystallites. The B1 to B2 phase transition in CdO was previously only reported under hydrostatic pressure conditions [1]. By varying the Cd content and adjusting the growth conditions, we have succeeded in stabilizing the metastable B2 phase under ambient conditions, which holds significant potential for applications in energy storage and stress sensing.

References:

[1] H. Liu, H. Mao, M. Somayazulu, Y. Ding, Y. Meng, D. Häusermann, B 1-to-B 2 phase transition of transition-metal monoxide CdO under strong compression, Phys Rev B. 70 (2004) 094114.