

Local Amorphous Structure Controls Polymorph Formation

Scientific Achievement

Used grazing incidence X-ray scattering measurements to identify local structural differences in amorphous thin-film precursors that subsequently determine the polymorph formed upon crystallization.

Significance and Impact

Demonstrates that small deposition-dependent differences in local amorphous structures can be used to control the targeted synthesis of specific polymorphs.

Research Details

Precursor Synthesis: Amorphous VO_x thin-film precursors with differing local structure were grown by pulsed laser deposition using different laser pulse rates (2 Hz and 10 Hz) at ambient temperature.

Structural Characterization: The local structure of the amorphous precursor films was measured using grazing incidence pair distribution function (GIPDF) measurements. *In-situ* X-ray diffraction during annealing was used to monitor the crystallization process and measure the final polymorph formation.

Targeted Polymorph Synthesis: The local structure of the amorphous precursor controlled the growth of either R-phase or B-phase polymorphs of VO_2 .

K.H. Stone *et al.*, *APL Materials*, 2016. DOI: 10.1063/1.4958674

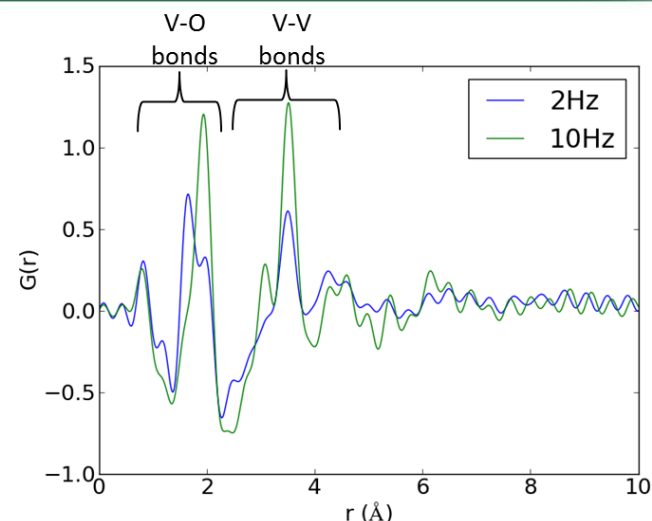


Fig. 1: Radial pair distribution functions for the amorphous precursors showing different local structure.

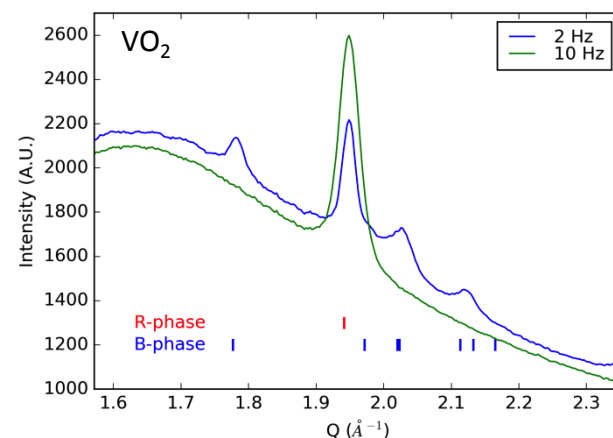


Fig. 2: X-ray diffraction of crystallized films showing R-phase formed from 10 Hz precursor and B-phase from 2 Hz.