

Observation of Unusual Structural Phase Transition in VO₂ Thin Film on GaN Substrate

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High quality VO₂ thin films were successfully grown on GaN substrate by optimizing oxygen partial pressure during the growth using RF sputtering technique. The VO₂ thin film grown on GaN substrate exhibited an unusual metal insulator transition behavior, which was known to be observed only either in doped sample or under uniaxial stress. Raman spectra also confirmed that metal insulator transition occurred from monoclinic M1 to rutile R phase via monoclinic M2 phase with increasing temperature. We believe that large lattice mismatch between VO₂ and GaN substrate may cause M2 phase to be thermodynamically stable. Optical transmittance and its electrical switching behavior were carefully investigated to elucidate the underlying physics of its metal insulator transition behavior. This study may lead to a unique opportunity to better understand the growth mechanism of M2 phase dominant VO₂ thin films.

Keywords: VO₂, Metal-to-insulator transition, Sputtering, M2 phase