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Title:Terahertz transmission characteristics across the phase transition in VOinf2/inf films deposited on Si, sapphire, and SiOinf2/inf substrates
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Abstract:Vanadium dioxide (VOinf2/inf) films were deposited on high-purity Si, sapphire, and SiOinf2/inf substrates by an organic sol-gel method. The effect of the substrate on the structure, morphology, and phase transition properties of the VOinf2/inf films was demonstrated. We proposed that the film-substrate interaction induced the differences in the fraction of the +4 valence state vanadium oxide phase, surface morphology, and grain size for the VOinf2/inf films. The VOinf2/inf film on the Si substrate exhibited a switching property of about 2 orders of change in electrical resistivity. By contrast, the VOinf2/inf films on the sapphire and SiOinf2/inf substrates exhibited a switching property of about 3 orders of change in resistivity. The THz transmission across the phase transition in the VO inf2/inf films was quite different in the transmission modulation ratio, the width, and the slope of the hysteresis loop. In particular, the VOinf2/inf films on the sapphire and SiOinf2/inf substrates have the same reduction in THz transmission by about 46% comparing with about 35% in the VOinf2/inf film on the Si substrate. Furthermore, the VOinf2/inf film on the SiO inf2/inf substrate exhibits the widest hysteresis loop with the steepest slope. © 2012 American Institute of Physics.
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Controlled terms:Electric conductivity - Hysteresis loops - Sapphire - Silicon - Sol-gel process - Vanadium - Vanadium compounds
Uncontrolled terms:Electrical resistivity - Grain size - High-purity - Phase transition properties - Si substrates - Switching properties - Terahertz transmission - Transmission modulation - Valence state - Vanadium dioxide - Vanadium oxides

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