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Title:Enhanced hydrophilicity of the Si substrate for deposition of VO<sub>2</sub> film by sol-gel method

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Abstract:We have illustrated the role of hydrophilic nature of Si substrate played in the improvement of the contact performance between the vanadium dioxide (VO<sub>2</sub>) film and Si substrate. The VO<sub>2</sub> films were fabricated by sol-gel method on single crystal Si substrate, which was pre-treated with hydrophilic solution and obtained a quite improved hydrophilicity. The bonding of Si substrate with precursor V<sub>2</sub>O<sub>5</sub> gel was interpreted. The morphology and crystalline structure of the films were investigated by fieldemission scanning electron microscopy, atomic force microscopy and X-ray diffraction. It is shown that the surface of the film on Si substrate with enhanced hydrophilicity is quite homogeneous and uniform. The film exhibits the formation of VO<sub>2</sub> phase with (011) preferred orientation. Moreover, the optical pump induced phase transition property of the film was studied by terahertz time-domain spectroscopy, which revealed around 70% reduction of transmission at 0.1-1.5 THz in the VO<sub>2</sub> film across the phase transition. © Springer Science+Business Media, LLC 2012.

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