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Effect of annealing temperature on vanadium dioxide thin films prepared by sol gel method

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Abstract content
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Vanadium dioxide (VO2) is a functional material that undergoes a reversible metal-insulator phase transition (MIT) at a critical temperature (Ttr) of 68 ◦C, accompanying the structural transition from high-temperature rutile to low-temperature monoclinic phases. The semiconductor to metal transition exhibits abrupt changes in optical, electrical and magnetic properties. Therefore, these characteristics make VO2 a promising material for a wide variety of applications including thermal sensors, uncooled microbolometers, and electrochromic switching devices. Many methods have been developed to deposit VO2 thin films with high performance, including physical vapor deposition, chemical vapor deposition and sol–gel method. Sol–gel method is used widely because of many advantages. It can be coated on complex shape or large substrate surface. It is easy to introduce other elements for doping. Furthermore, special organic–inorganic multiple coating can be obtained by sol–gel method. Inorganic sol–gel method makes use of ordinary raw materials. However, it needs rigorous experimental condition because of high annealing temperature. Meanwhile, organic vanadium alkoxides were used as precursors to prepare VO2 thin films in organic sol–gel method. The setback is that such precursors are expensive by commercial purchase. In order to solve this problem, the Vanadium pent oxide powder, isobutyl alcohol (IBA) and benzyl alcohol (BA) have been utilized to prepare organic precursor sol and vanadium oxide thin films. For this study we illustrate the realization of VO2 thin films on glass substrate and mica substrates ad different annealing temperatures by this organic sol-gel method.

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