The Effect of the Crystalline Structure Transformation in VO_2/Glass by Inserting TiO_2 Buffer Layer and Its Application in Smart Windows

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Received April 8, 2020
Revised April 15, 2020
Accepted April 15, 2020

Vanadium dioxide (VO_2) undergoes a reversible metal–insulator transition at low temperature, which has wide range of applications in smart windows and infrared detectors. However, the preparation of VO_2 films with controllable phase on glass substrate is still limited. In this paper, it is shown that *B*-phase can be transformed into *M*-phase with monoclinic structure by inserting TiO_2 buffer layer on glass substrate at low temperature of 400°C. This crystalline transformation might be attributed to that Ti atoms diffuse and form oxygen deficient environments. Different thicknesses of buffer layers have different effect on characteristic of VO_2 film. With 50 nm TiO_2 buffer layer, the VO_2/TiO_2/glass film showed an abrupt resistance change with more than 2.5-order of magnitude across metal–insulator transition, and the visible-light transmittance value is as high as 55.5% with the solar modulation capability up to 8.6%. The current results are very important for the application in smart windows.

Keywords: vanadium dioxide, TiO_2 buffer layer, metal–insulator transition, solar modulation capability.

Full text of the paper will appear in journal SEMICONDUCTORS.