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Visualization of local phase transition behaviors in ultrathin VO_2/TiO_2 thin films AHRUM SOHN, Ewha womans university, TEROU KANKI, HIDEKAZU TANAKA, Osaka university, DONG-WOOK KIM, Ewha womans university — VO_2 undergoes the first order phase transition and two electronic phases can coexist near the critical temperature. We investigated evolution of the surface work function maps of epitaxial VO_2/TiO_2 thin films (thickness: 15, 30, and 45 nm) using Kelvin probe force microscopy (KPFM) measurements in the temperature range of 285-330 K. Fully strained thin films were almost free of grain boundaries and thicker films had dislocations caused by strain relaxation. The sample's work function decreases, while spanning the metal-insulator transition (MIT). The work function maps clearly revealed coexistence of the two distinct phase domains. The surface area fraction of the insulating phase near the dislocations was higher than that in other regions. Thicker films have complicated domain patterns; hence, the three-dimensional percolation model properly described the MIT behaviors. In contrast, the two-dimensional percolation model well explained the transition behaviors of uniformly strained thinner films.

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