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Electrical properties of VO_2 layers on Y-ZrO_2 substrates

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The VO_2 metal insulator transition (MIT) at about 340 K is a topic of long standing research. Apart from the elucidation of the transition mechanism, it has attracted intensive application-oriented research interest originating by the dramatic change of electrical resistivity accompanying this ultrafast structural transition. Emphasis is given to emerging devices operable by triggering the MIT transition by small thermal, electrical or optical perturbation at around RT.
In the present work, VO_2 layers with typical thickness of 10 μm were investigated by electrical resistivity, I-V measurements, XPRD and SEM. Using Y-ZrO_2 substrates, sintered as well as dense VO_2 layers were obtained by annealing V_2O_5 layers in the range 450-600 ^oC under vacuum (10^{-2}mbar).
Specimen show semiconducting behaviour at 80 K< T < T_{MIT} with an activation energy E_a≈0.1 eV. The observed MIT at T_{MIT}=327.1 K results in an up to 3 orders of magnitude drop of the electrical resistivity, taking place within a ~4 K temperature interval. According to the I-V measurements the MIT can be triggered by a dc applied electric field as well as by joule heating.