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Local metal-insulator transitions in V2O3 thin films studied by 57Fe emission Mössbauer spectroscopy

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Metal to Insulator-to-transitions (MIT) driven by electronic interactions in strongly correlated materials are among the most remarkable phenomena in condensed matter physics. It has been found important applications in the next-generation so-called "beyond silicon"electronics and neuromorphic devices. Vanadium sesquioxide V2O3 is a prototypical Mott insulator, which undergoes the MIT between an antiferromagnetic insulator (AFI) and a paramagnetic metal (PM) or a paramagnetic insulator (PI) by varying the temperature, pressure, doping of material or photoexcitation. However, the origin of MIT in V2O3 is still an on-going topic of active study owing to a complex interplay of multiple factors, such as the crystal-field splitting, electron-lattice interaction and orbital degeneracy, in the Mott transition. Particularly, in the thin film V2O3, the magnitude and temperature of the transition can be greatly affected by the local structural defects, material stoichiometry and film stress. Here we present the 57Fe emission Mössbauer spectroscopy study of the local MIT transition in the V2O3 thin films, which were grown with different crystalline and structural properties. The results show that…

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