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Resistive switching phenomena and metal-insulator transitions in VO_2 and V_2O_3 nanodevices. JAVIER DEL VALLE, ALIAKSEI CHARNUKHA, YOAV KALCHEIM, JUAN TRASTOY, ILYA VALMIANSKI, PAUL WANG, DIMITRI BASOV, Department of Physics, University of California San Diego, IVAN K SCHULLER, Department of Physics and Center for Advanced Nanoscience, University of California San Diego, SCHULLER NANOSCIENCE GROUP TEAM, BASOV INFRARED LAB COLLABORATION — The VO_X family comprises a large number of oxides, most of which are known to exhibit a Metal-Insulator phase transition (MIT). However, the temperature at which this MIT takes place varies greatly, even for oxides very close in stoichiometry. This makes the study of vacancy drift and filament formation in vanadium oxides an attractive subject, as it can potentially couple two phenomena that have raised much interest: resistive switching and insulating phases in correlated materials. We have fabricated VO_2 and V_2O_3 nanojunctions with a 100-200 nm gap that allows us to apply high electric fields and induce a resistive switching in the sample. Transport measurements after the switching reveal multiple jumps in the resistivity as a function of the temperature, suggesting the formation of new insulating phases. This effect could potentially generate a rich variety of new electrical functionalities in materials presenting a MIT. We thank the AFOSR for financing this research.

Javier Del Valle Granda
Department of Physics, University of California San Diego

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