Controlling Electronic Phase Changes in Correlated Electron Oxides

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ABSTRACT

Phase change is most commonly used to describe transition between solid-solid, -liquid and -gaseous states of matter In the rare case among their phase changes, electronic phase changes is promising for utilization of electronics, which are usually accompanied by huge resistivity changes with several orders of magnitude, and are widely observed in correlated electron systems. Of the prototypical materials, vanadium dioxides (VO_2) have an attractive characteristic of metal-insulator transition (MIT) over room temperature. The MIT, namely changing between insulator in an electron-crystal state and metal in an electron-liquid state, occurs by external stimuli such as temperature variation, electric field, strain and light. Its original mechanism of the MIT is still under intense debate in condensed matter physics. Regarding the applications, on the other hand, VO_2 have been paid much attention to realize emerging devices based on electronic phase change. The key point is how to control coexistence electronic clusters in nanoscale, playing an essential role to determine the inclusive physical properties in devices. In this presentation, I will mainly talk the bias voltage-induced multistate memristive or switching devices and their perspective in the future.

Key words: Electronic Phase Change, metal-insulator transition, vanadium dioxide