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Orbital selective phase transition[1] YU-ZHONG ZHANG, Physics Department, Tongji University, Shanghai 200092, P.R. China, HUNPYO LEE, Institut für Theoretische Physik, Goethe-Universität Frankfurt, Frankfurt am Main 60438, Germany, HAI-QING LIN, Beijing Computational Science Research Center, Beijing 100089, China, CHANG-QIN WU, Department of Physics and State Key Laboratory of Surface Physics, Fudan University, Shanghai 200433, China, HARALD JESCHKE, ROSER VALENTI, Institut für Theoretische Physik, Goethe-Universität Frankfurt, Frankfurt am Main 60438, Germany — Orbital selective phase transition (OSPT), proposed to be responsible for the coexistence of localized and itinerant electrons, has attracted extensive interest from both experimentalists and theoreticians, since the observation of an anomalous behavior with a Curie-Weiss-like local spin in the metallic phase of $Ca_{2-x}Sr_xRuO_4$ at $0.2 \leq x \leq 0.5$. Recently, even more attentions have been paid to OSPT since the coexistence of localized and itinerant electrons may reconcile the strong debates on how to understand the origin of magnetism in various iron-based superconductors. Here, various mechanisms for OSPT are reviewed and a new mechanism will be proposed. The distinct band dispersion of different orbitals, which should be generally satisfied in various materials, is identified to be the crucial point for OSPT with magnetic order. Such an OSPT are not sensitive to the strength of Hund's rule coupling. Heavy doping favors collinear antiferromagnetic state over the OSPT. Discussions are made related to the pnictides.

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