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Electronic Properties in Frustrated Lattices *

Sadamichi Maekawa

Institute for Materials Research, Tohoku University, Sendai, Japan

Cobalt oxides (cobaltates) with layered hexagonal crystal structure exhibit giant thermopower, giant Hall effect, ferromagnetism, and superconductivity depending on the material details. In particular, the superconductivity has received special attention in connection to the high-temperature superconductivity in cuprates. The active electronic states are t_{2g} with orbital degeneracy and the e_g without degeneracy in cobaltates and cuprates, respectively. The giant thermopower in cobaltates is caused by the degeneracy of t_{2g} orbitals in Co ions [1]. Here, we show that the orbital degeneracy brings about a Kagom lattice electronic structure hidden in the CoO_2 frustrated triangular crystal lattice [2]. This is because the electron hopping occurs between Co ions via neighboring oxygens by exchanging the orbitals in the triangular lattice. A variety of the unique physical properties in cobaltates are discussed in the light of the electronic structure [3].

This work has been done in collaboration with W. Koshibae.

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