“Pudding mold”-type band dispersion as the origin of large thermopower in Na$_x$CoO$_2$

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Na$_x$CoO$_2$ is an interesting material in that it has large thermopower, non-trivial magnetic property, and becomes superconducting when water molecules are intercalated. Recently, in Ref. 1 and 2, we proposed that the magnetism and the superconductivity can have the same root. Namely they can originate from the peculiar band dispersion of a$_{1g}$ band. In this study, by using Boltzmann’s equation, we calculated the thermopower of this system. We found that the origin of the coexistence of the large thermopower and the low resistivity in this material is that not just the density of states, the effective mass, nor the band width, but indeed again the peculiar “pudding mold”-type band dispersion of the a$_{1g}$ band which consists of a dispersive portion below the Fermi level and a dispersionless portion above the Fermi level[3].


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