The resistivity of grain boundary of K-doped ruthenates in percolative conduction regime

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Abstract: Percolation theory has been involved to explain the temperature dependence of conductivity in the K-doped perovskite ruthenates and to estimate the resistivity of grain boundary in the percolative conduction regime. Using the two-layer simple effective medium model [A. Gupta, G.Q. Gong, G. Xiao, P.R. Duncombe, P. Lecoeur, P. Trouilloud, Y.Y. Wang, V.P. Dravis, J.Z. Sun, Phys. Rev. B 54 (1996) R15629] and assuming the scaling property of grain boundary system, we have obtained the new formula for grain boundary resistivity, which contains important factors for the grain size, boundary thickness, and boundary fractal dimension. The numerical results for the system $A_{0.5}K_{0.5}RuO_3$ (A=La, Y, Nd, Pr) are in very good agreement with the experiment. Importantly, it reveals that the percolative conduction plays a significant role in ceramic compounds containing polycrystalline grains and grain boundaries.

Author Keywords: A. Ruthenates; C. Grain boundary; D. Fractal; D. Percolation; D. Resistivity

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