DC electrical conductivity of semiconducting cobalt–phosphate glasses

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Abstract

The dc conductivity of semiconducting cobalt–phosphate glasses has been measured at temperatures ranging from 213 to 530 K. Four bulk samples of CoO–P₂O₅ glasses of different compositions were produced by melting dry mixtures of analytical reagent grades of CoO and P₂O₅ at temperatures between 1200–1250 °C for 2 h using a press-quenching method from glass melt. Samples were annealed at 400 °C for 1 h. The dc conductivity was found to be dependent on the CoO content in the glass. At temperatures from 213 to 444 K, however, both Mott’s variable-range hopping (VRH) and the Greaves’ intermediate range hopping models are found to be applicable. VRH at this range of temperatures is attributed to large values of the disorder energy of these glasses.

Keywords: Low temperature of TMO glasses; Semiconducting glasses; TMO glasses; Phosphate glasses