E1-42: An investigation of electrical properties of Y-doped $BaTiO_3$ ceramics with different Mn additions

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Donor doped $BaTiO_3$ ceramics show a Positive Temperature Coefficient Resistance (PTCR) effect, which is the DC resistivity value change by many orders of magnitude with temperature. As such, $BaTiO_3$ based ceramics have found many applications as TV degaussers, thermal sensors, self regulated heaters, current surge protectors and thermistors.

The work presented is mainly concerned with the PTCR characteristics of the Y-doped $BaTiO_3$ ceramic as a function of Mn concentration and the nature of the current transport process of this ceramic. Further, the improvement of the ohmic contact behaviour with different electrode materials was investigated. Specimens with formula $(Ba_{0.997}\ Y_{0.003})\ TiO_3$ having different Mn additions (0.025 -0.100 mol %), were prepared by wet and dry ball milling. Identification of crystalline phases was performed by XRD and electrical measurements were carried out by using a 2 probe DC measurement technique, after In-Ga electroding on the specimens.

It was observed that the ohmic contact of the sample was greatly improved, after In-Ga or Au (Engelhard) electroding on the specimen. Addition of Mn significantly enhanced the PTCR effect of the Y-doped $BaTiO_3$ ceramics. However, a large amount (more than 0.100 mol %) of Mn-addition increased the room temperature resistivity. This is probably due to formation of non-conducting second phases at grain boundaries obstructing the conduction channels between the grains. A similar observation has been reported by Lee *et al* for B-added Y-doped $BaTiO_3$ ceramics. The characteristics of current-voltage behaviour followed the modified classical Heywang model suggested by Zhang & Cao for Y-doped $BaTiO_3$ ceramics.

Financial support by University of Peradeniya and University of Jaffna is acknowledged.