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TEXTURED THICK FILMS OF $BI_2SR_2CA_1CU_2O_X$

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Dense thick textured films of $Bi_2Sr_2Ca_1Cu_2O_x$ are obtained by partially melting and slow cooling porous films with the 2212 composition produced by doctor-blade casting or dip coating. Heat treatment between 890 and 870°C produces aligned microstructures on substrates of either Ag or Ag coated MgO. Since other metallic substrates have not been thoroughly investigated the effect of Au and Pt on the formation of textured films was investigated. The microstructure and properties of these films will also be presented. Observations show that as the substrate material is changed from Au, Ag, and Pt the melting point of the oxide decreases from 880°C, to 865°C, and 835°C, respectively. The Pt substrate lowers the melting point of the oxide the most due to the formation of a Bi-free compound. The formation of this Bi-free Pt-Sr-Ca-Cu compound produces a Bi-rich liquid with a low melting point, less than 835°C. During heat treatment dissolution of Ag into the liquid oxide occurs. Since silver lowers the melting point of the oxide, the processing temperatures must be increased by about 10°C when an MgO substrate is used. The resulting films show that the oxide surface plays an important role in grain alignment. The $Bi_2Sr_2Cu_1O_x$ phase, stable for temperatures greater than about 870°C, always transforms to the desired $Bi_2Sr_2Ca_1Cu_2O_x$ phase regardless of the heat treatment history (quenched from 890°C and annealed at 870°C or slowly cooled from 890°C to 870°C). Although, silver is incorporated into the oxide layer, Ag-based compounds form. The lower melting point is believed to be due to a Ag-CuO eutectic reaction similar to that observed in the Ag-thallium cupurate superconductors.