

YBaCuO THIN FILMS PREPARED BY ORGANOMETALLIC AEROSOL DEPOSITION.

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The method of chemical aerosol deposition has become a simple and inexpensive approach to the preparation of superconducting thin films. The best results are expected when the aerosol deposition is conducted in the regime of chemical vapor deposition because then very good homogeneity in the film growth with consequently the need of only a reduced temperature treatment can be expected. We used several metallorganic precursors; the best results were obtained with tetramethyl-heptanedione salts, Y(TMHD)₃, Ba(TMHD)₂ and Cu(TMHD)₂. These salts could be dissolved in the organic solvent n-butylacetate. The solution was sprayed with the aid of an ultrasonic nebulizer on a silicon substrate coated with a ZrO₂ buffer layer at a temperature of 450°C. After preparation, the following heat treatment was given: (1) warming up from 250°C to 800°C at the rate of 20°C/min under a flow of N₂ gas and then keeping the temperature 20 minutes at 800°C; and (2) slowly cooling down at a rate of 0.5°C/min under a flow of O₂ gas.

The structures of the films prepared in this way were analyzed by x-ray diffractometry. The good films exhibit an orthorhombic structure with the c-axis aligned perpendicular to the surface. The composition was determined by x-ray fluorescence and Scanning Auger Microscopy (including sputter depth profiles). In the best cases, SEM analysis reveals a homogeneous granular structure of the films, the size of the grains being 250 nm. The best films show superconducting transition temperatures for the onset and zero resistance of 95K and 75K respectively. There are studies in progress to use these films in light detection devices.