

LOW COST FABRICATION OF THIN-WALLED SOLID ELECTROLYTE TUBES FROM DOCTOR-BLADED CERAMIC TAPE

Corporate Applied Research Group, Globe-Union Inc., 5757 North Green Bay Avenue, Milwaukee, WI 53201 (U.S.A.)

The objective of this project is to develop and demonstrate the feasibility of fabricating beta double prime alumina tubes using doctor-bladed (cast) ceramic tapes. By using a cast tape, which is fabricated on a production scale in the electronic ceramics industry, tubes with thinner walls than those conventionally produced by isostatic pressings or electrophoresis may be produced. Development efforts have concentrated on three areas: optimization of the tape casting parameters, establishing a suitable firing process, and evaluation of techniques for forming tubes.

The ceramic slip composition has been optimized to yield a doctor-bladed tape with consistently uniform thickness (0.1 mm), minimal variation in density (2 g/cm^3), no pinholes, and with sufficient flexibility to be used in forming green tubes. The ceramic powder used for tape casting was prepared by the "zeta" process and contains nominally 90.4 wt.% Al_2O_3 , 0.75 Li_2O , and 8.85 wt.% Na_2O . Closed end beta double prime tubes with 0.3 mm wall thickness, 1 cm diameter, and 8 cm in length, with longitudinal electrical resistivity of 3 - 8 ohm cm at 300°C have been fabricated by lapping multiple layers of tape around a supporting mandrel to form the tube and by using a two step, high rate sintering method to fire the ceramic.

Work is also in progress to fabricate tubes by spirally winding the tape around a supporting mandrel. Evaluation of the technical feasibility of adapting commercial tube wrapping equipment for mass production will be included in the final report.

Recent publications

- 1 R. T. Dirstine, Fabrication of $\beta''\text{-Al}_2\text{O}_3$ tubes from cast ceramic tape, in P. Vashishta, J. N. Mundy and G. K. Shenoy (eds.), *Fast Ion Transport in Solids, Electrodes and Electrolytes*, North Holland, Amsterdam and New York, 1979.