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Possible observation of superconductivity at 300 K

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Abstract. We report an observation of superconducting transition at 300 K in fluorinated Y-Ba-Cu-O system for the first time.

Keywords. Fluorinated Y-Ba-Cu-O; superconducting transition.

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The relentless research endeavours have successfully yielded superconductivity in the 100 K range in compounds of Y-Ba-Cu-O and other similar oxides (Rao and Ganguli 1987; Ganguly *et al* 1987; Cava *et al* 1987). Recently the presence of a superconducting phase in such a oxide material at 230 K has been reported (Gupta *et al* 1987; Jayaram *et al* 1987). The superconductor research pace has quickened worldwide to achieve and claim highest possible T_c in these superconducting ceramics.

In this race our research efforts has recently resulted in further improvement in the T_c value. We have observed a superconducting phase in fluorinated Y-Ba-Cu-O at 300 K. The samples are in the form of circular discs of 1·5 cm diameter and a few mm thickness.

The samples are prepared by thoroughly mixing Y_2O_3, Ba-CO_3 and CuO in appropriate amounts. Powder is cold pressed under a pressure of about 8 kbar to obtain circular discs. The solid state reaction is performed by heating the pellets at 950–1000° C for 12 h in air. The pellets are crushed to fine powder and repelletized, which are subsequently oxidized in flowing O_2 at 950° C for 8–10 h. These are then fluorinated using ion-implantation to a doping level of about 10^{19} atoms/cm^3.

The temperature dependence resistance measurements are carried out employing the standard four-probe technique. Ohmic contacts are made with air drying silver paint. Temperature is monitered using a standard 100 ohm platinum resistance thermometer. Current from a constant current source is applied through the outer probes and the d.c. voltage is measured across the inner contacts using a high impedence Keithley nano-voltmeter. Correction for thermal e.m.f. is applied to each measurement.

Figure 1 demonstrates the temperature dependence of sample resistance. It clearly shows a sharp superconducting transition of 300 K with transition width $\Delta T_c \sim 2$ K. Resistance drop of about 30 times (from 750 mohm to 24·5 mohm) at 300 K manifests