Overview of YBCO

Synthesis and Characterization Project

(from Summer 2005, 2006 and 2007)

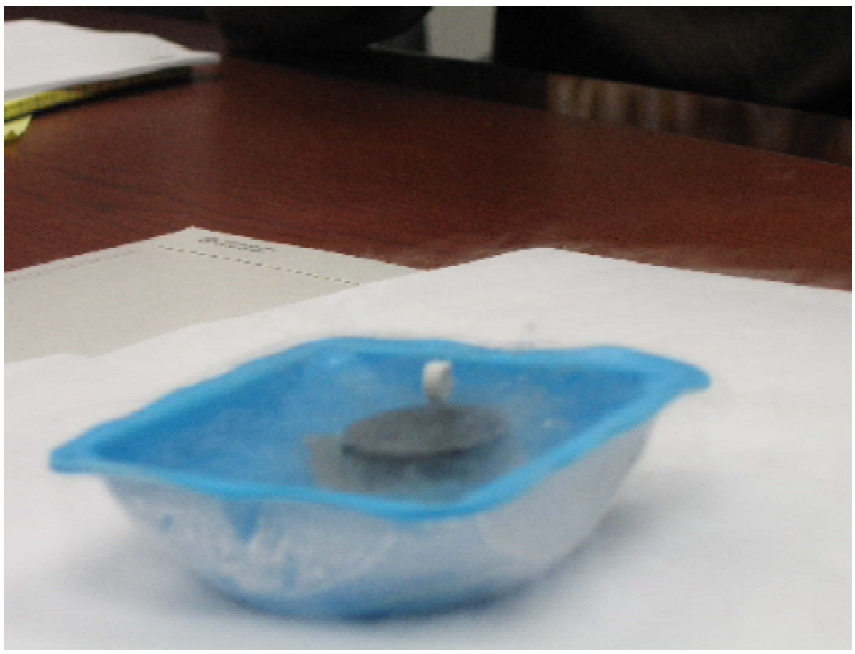

Fig. 1(a). Demonstration of levitation of magnet by superconducting pellet. The black disk in the blue tray of liquid nitrogen at 77 K (-320.8º F). The object floating in the mist is a small permanent magnet.

Fig. 1(b). Manipulating the floating magnet (Yssania, Louis and Alfred)

Fig. 2. Students (Monica, Digena, Nana and Avani (from left to right)) taking pictures of floating magnet during first demonstration of Meissner effect demonstration and tutorial.

Fig. 3. Weighing the components (Y_2O_3, CuO and BaCO3), needed to get the correct stoichiometric ratio for YBCO ($YBa_2Cu_3O_{6+x}$).

Fig. 4. Sample components mixed and then ground to a fine grey powder.

Fig. 5. Sample placed in Alumina crucible with lid for calcination (firing at high temperature ~ 950º C) in high temperature furnace.

Fig. 6. Black powder obtained after several heating cycles. Sample pressed into pellet and reheated.

Fig. 7. Meissner effect test of pressed pellet.

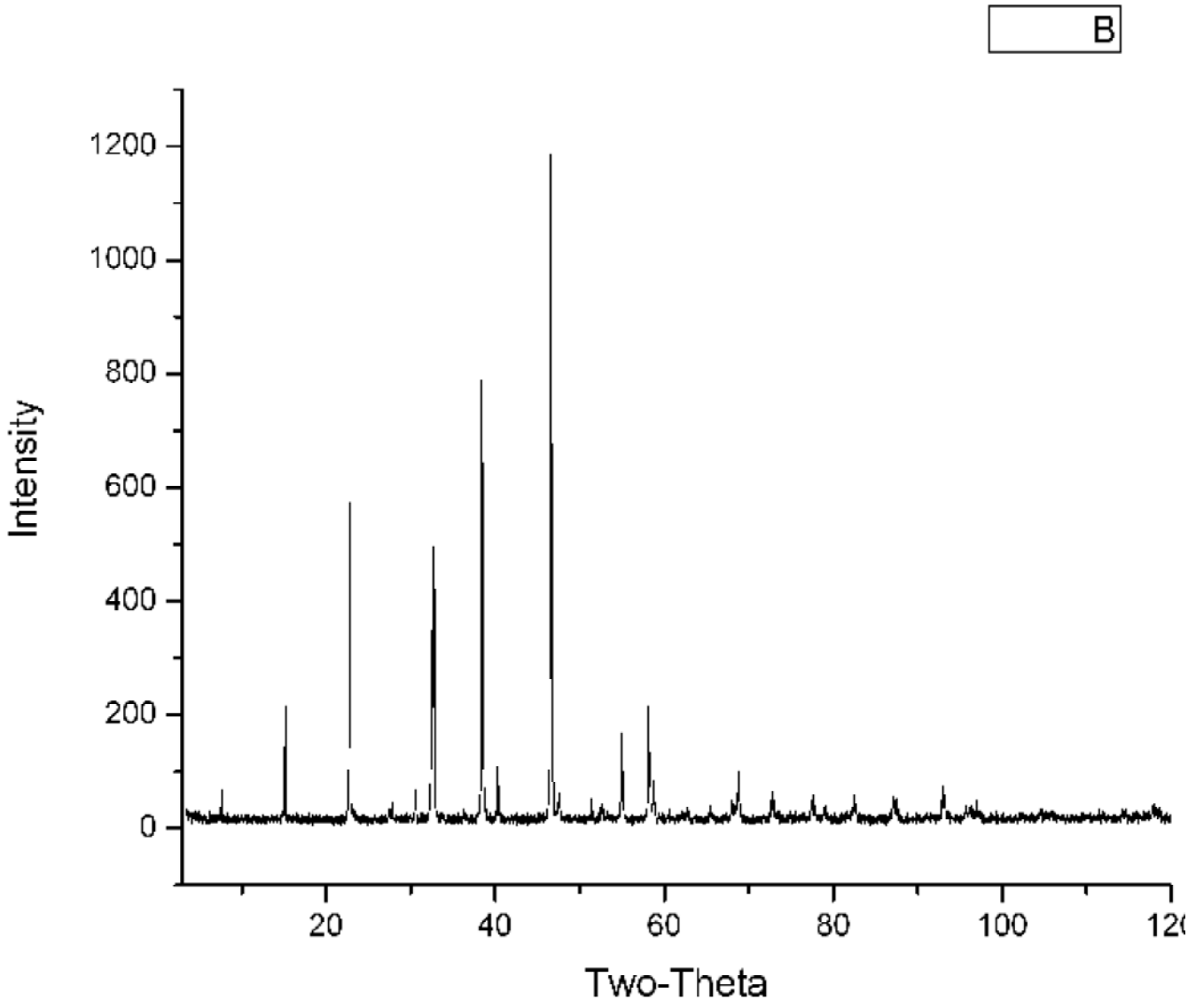

Fig. 8. X-Ray Diffraction pattern of the powder YBCO sample.

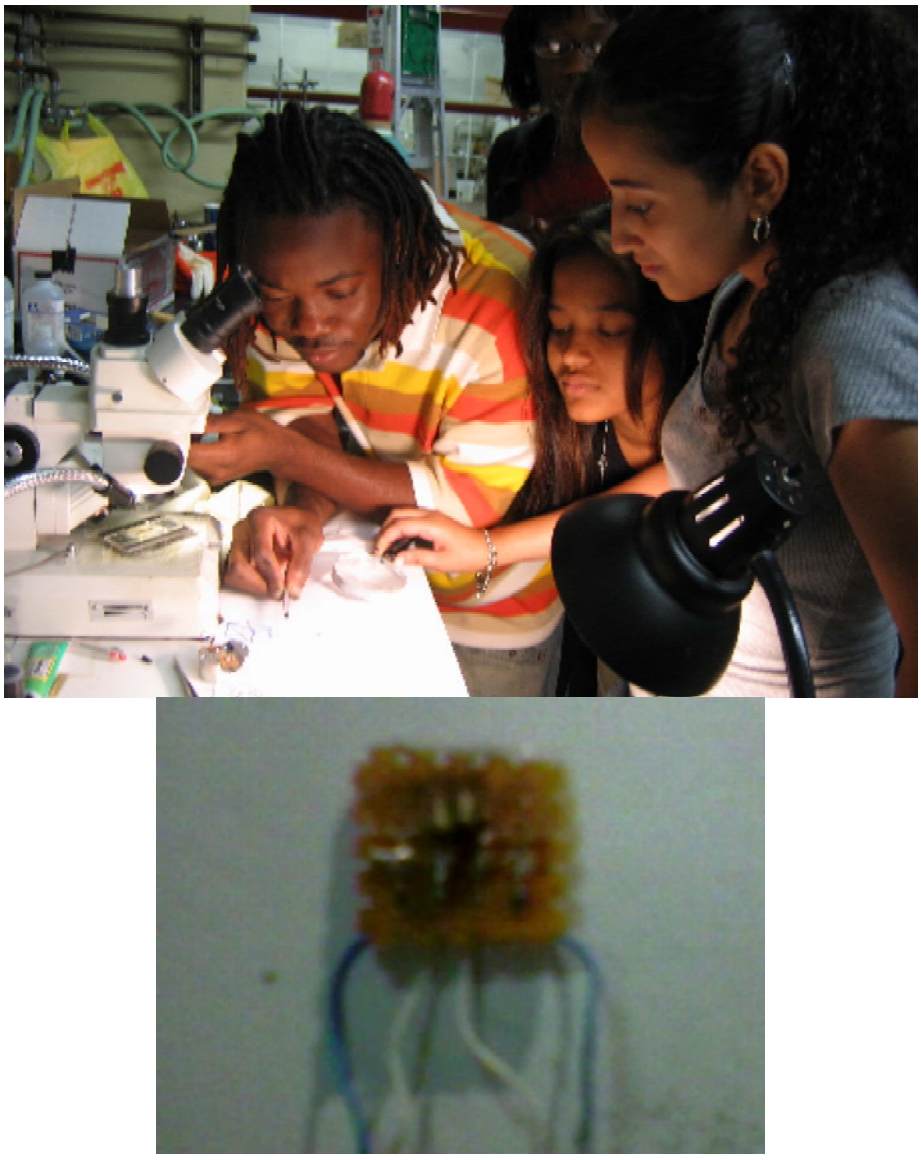

Fig. 9. Preparing a rectangular (polished) sample for Resistivity measurements. Rectangualr sample as placed on circuit board.

Fig. 10. Resistivity Measurement Apparatus showing top of cryostat with sample support rod.

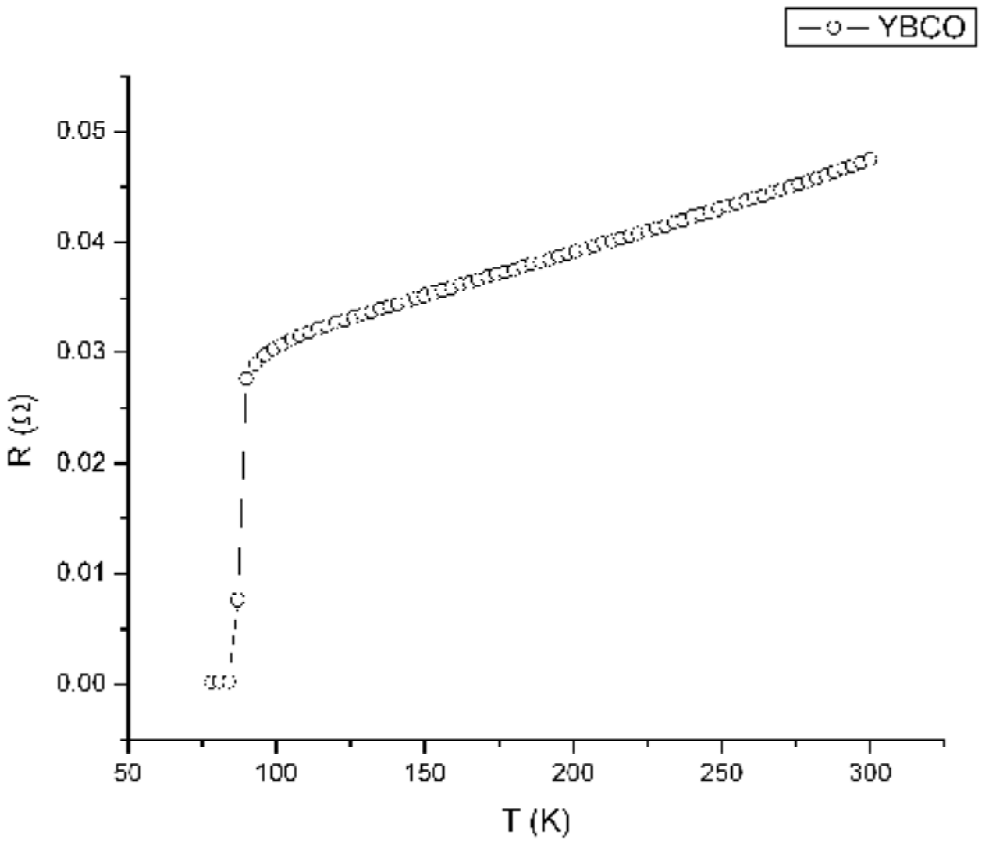

Fig. 11. Resistance as a function of temperature for the sample can be converted to resistivity using the measured sample dimensions.

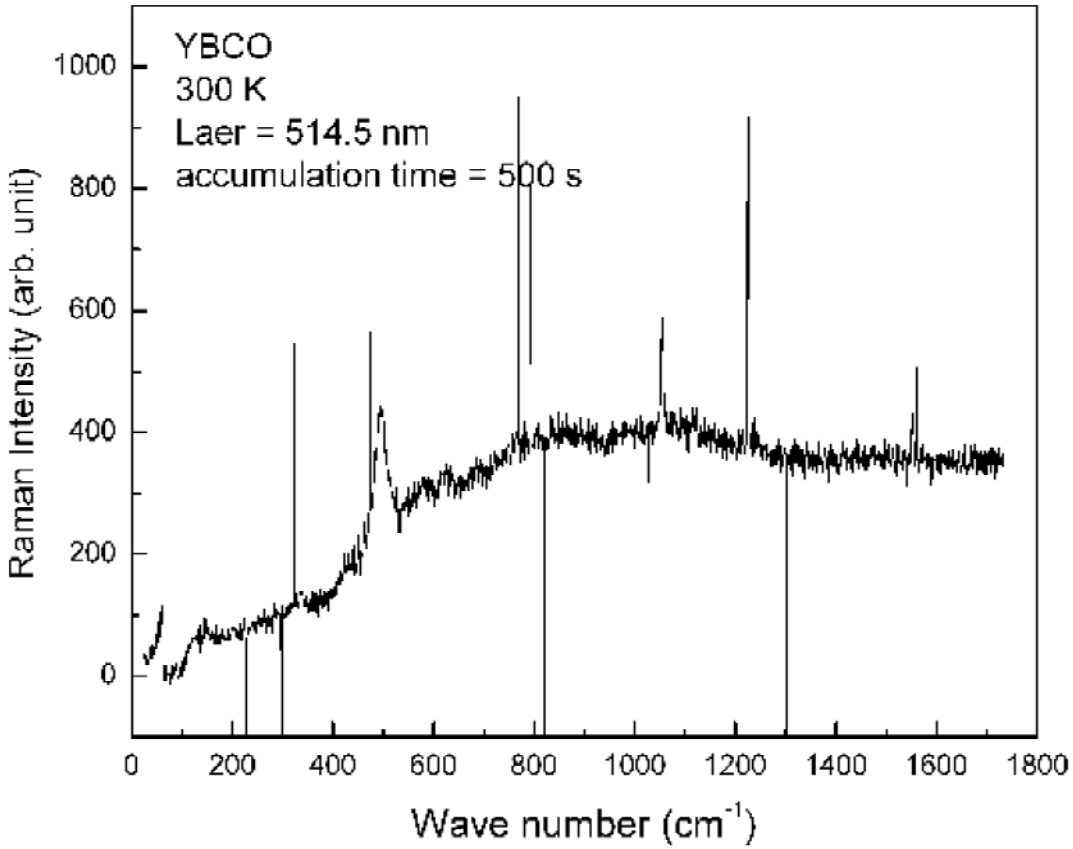

Fig. 12. Raw Raman data with sharp singlepoint spikes from cosmic ray hits. Measurments conducted in Prof. T. Zhou's lab.

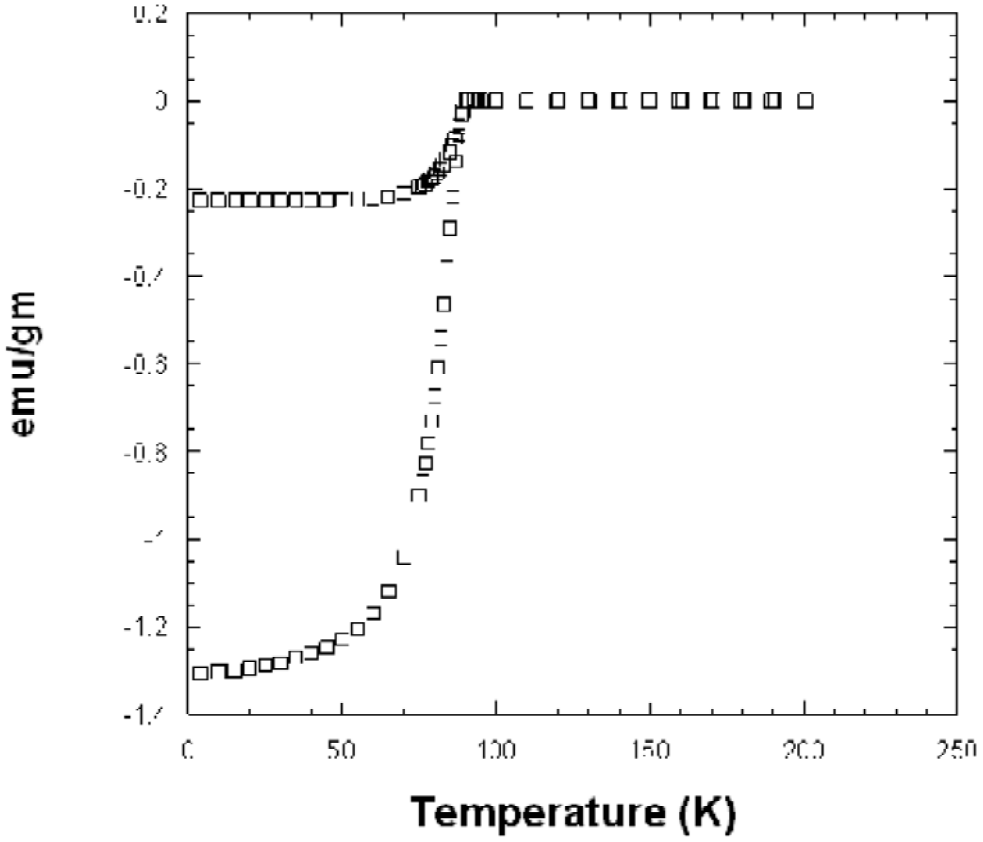

Fig. 13. Magnetization measurements in a 100 G field to determine the superconducting fraction of the sample. The zero field cooled portion of the plot can be used to extract the superconducting fraction. Measurements were conducted at Prof. M. Greenblatt's Lab. at Rutgers University.