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Advances in Novel $YBa_2Cu_3O_{x-\delta}$ Superconducting Materials

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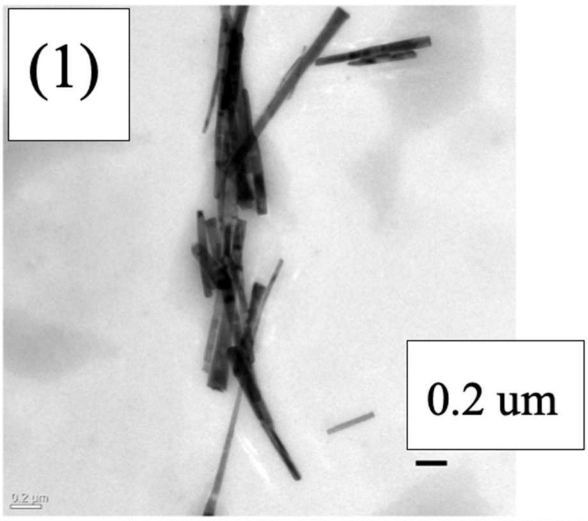
We report the fabrication of high-temperature superconductor $YBa_2Cu_3Ox_{-\delta}$ (YBCO) in the various new forms of wafers, bi-wafers, and spiral morphologies made by solution chemistry [1]. Reagent grade oxides of Yttrium Oxide (Y_2O_3), Barium Oxide (BaO) and Copper Oxide (CuO) in stoichiometric proportions prepared in solution, and upon precipitation, an intimate mixture of fine-grained materials was obtained [2]. The precipitate calcined at 773 K for two h, then subsequently converted to YBCO morphologies by heating to 1223 K in oxygen for 12 h. X-ray diffraction in one case showed that the powder consisted of nanorods and nanotubes predominantly of the $YBa_2Cu_3Ox_{-\delta}$ phase. A critical superconducting transition temperature T_c of 92 K achieved in a critical magnetic field of 10 Oe, along with observing the Meissner effect using MMPS.

Herein, this presentation presents additional material of this novel discovery not presented in our previous work [3] of these. Transmission electron microscope (TEM) and scanning electron microscope (SEM) images (Fig. 1—2) reveal the tubular morphology of the structures. A significant finding is that these morphologies are superconducting without the need for further sintering or oxygenation, providing an avenue for the application of $YBa_2Cu_3O_{x-\delta}$ to substrates at room temperatures or direct use in the form of a superconducting powder.



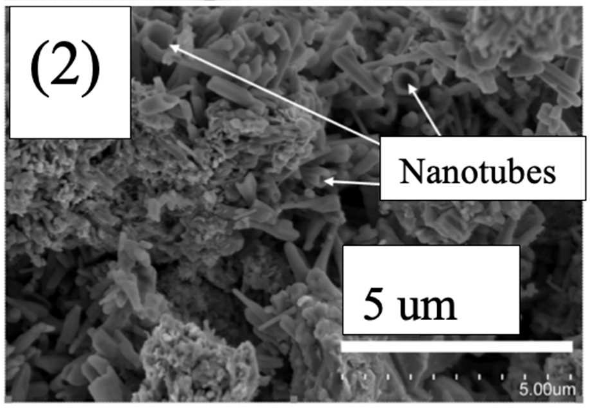


Figure (1): TEM image of superconducting nanorods and nanotubes showing thickness as little as 50 nm and lengths of several micrometers. Figure (2): SEM image of slice of material clearly showing nanotubes.

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