

YBCO nanowires grown by the alumina template method

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High- T_c superconducting $\text{YBa}_2\text{Cu}_3\text{O}_x$ (YBCO) nanowires are grown by the anodized alumina template method, starting from pre-sintered YBCO powder. As templates, we have employed commercially available alumina templates with pore diameters of 10 nm and 30 nm, and an overall thickness of 50 μm . An additional oxygen annealing step is required to obtain superconducting nanowires. Superconductivity with a transition temperature of 88 K is confirmed by means of magnetic susceptibility measurements (SQUID, AC susceptibility). The resulting nanowires are analyzed in detail employing electron microscopy (SEM, TEM) and atomic force microscopy (AFM). The separation of the nanowires of the templates is not yet established, but individual nanowires of up to 10 μm length could be separated from the template. In several cases, the template pores are not completely filled by the superconducting material, which implies that the observed length of approx. 10 μm is similar to what could be expected from regular grain growth. Furthermore, resistance measurements using cut pieces of the filled templates were carried out as a function of temperature. These pieces were covered with Au films on top and bottom in order to provide the electric contacts. The measurements confirmed the magnetically determined critical temperatures.