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Ultrathin copper/cobalt nanotubes prepared by codeposition from ammonia-sulfate complexes in ion track etched polycarbonate templates

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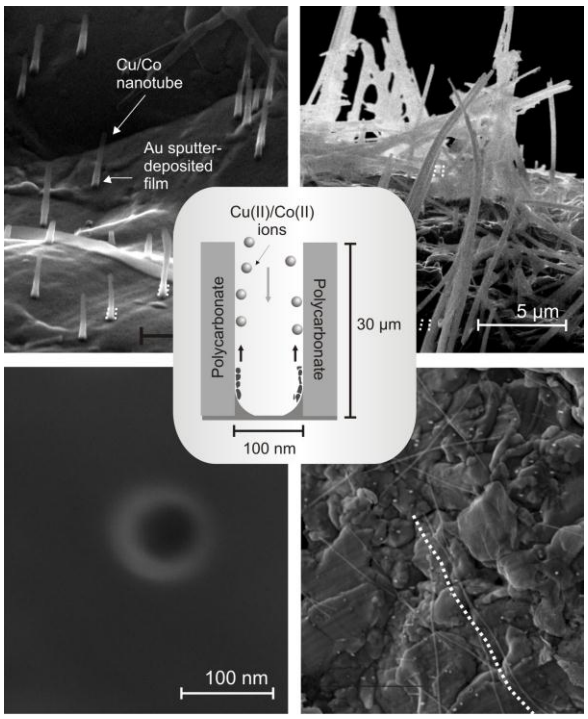
In the last decade, one-dimensional nanostructures, such as belts, tubes, wires, or rings have attracted great interest due to new various abilities to control their architecture accurately. Here, the template based method represents a versatile technique to vary the geometry parameter diameter and length especially in the case of tubes and wires. Those nanoconducting membranes such as anodic aluminum oxide (AAO) or ion track etched polymers have an array of parallel sided pores and can be easily filled with a selected material. Polymer templates are prepared by an irradiation process with heavy metal ions creating stochastically distributed tracks of radiation damage. In a following etching process a selected pore diameter is obtained.



We discuss the electrochemical deposition method of copper-cobalt alloys in ion track etched polycarbonate templates resulting in nanotubes with constant wall thicknesses of only 15-20 nm and lengths of 30µm. Before the coplating process, bath compositions are determined by polarization measurements. In order to adapt the reversible potentials of both metals, ammonia is used as complexing agent. Based on the plating conditions, a mechanism for the electrodeposition inside the pores of the polycarbonate template is proposed which explains the reproducible formation of a hollow geometry. Copper and cobalt compositions of the plated structures are examined by Energy Dispersive X-Ray Analysis (EDS).

References:

[1] D.M. Davis, E.J. Podlaha, "CoNiCu and Cu Nanotube Electrodeposition", Electrochemical and Solid-State Letters **8** (2), D1-D4 (2005)