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Electrodeposition of Bismuth Antimony Nanowires in Etched Ion-Track Membranes with Parallel and Interconnected Channels

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Bismuth antimony nanowires are fabricated by both potentiostatic and pulsed electrodeposition in etched ion-track polycarbonate membranes with both parallel as well as interconnected channels. The nanowires are characterized by x-ray diffraction, high-resolution scanning electron microscopy and energy dispersive x-ray analysis. The influence of the electrodeposition parameters (i.e. deposition potential, electrolyte composition) on the compositional and crystallographic characteristics of the nanowires will be discussed. [1] In addition, an analysis of the characteristic current-vs-time curves for the potentiostatic deposition of $Bi_{1-x}Sb_x$ in ion-track etched polycarbonate templates with parallel channels will be presented, discussing the influence of channel diameter, channel length, and concentration of Bi and Sb ions in the electrolyte on the diffusion coefficients. Our results confirm that pulsed electrodeposition results in a more homogeneous growth of the Sb nanowire arrays, which is important for technological implementation requiring reliable electrical contacts to thermoelectric nanowire arrays. By electrodeposition of Sb in interconnected nanochannels prepared by ion track technology and chemical etching, [2] we fabricated Sb nanowire networks with controlled wire diameter, wire density, and degree of interconnectivity.

References:

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[2] M. Rauber, I. Alber, S. Müller, R. Neumann, O. Picht, C. Roth, A. Schökel, M. E. Toimil Molares and W. Ensinger, "Highly-Ordered Supportless Three-Dimensional Nanowire Networks with Tunable Complexity and Interwire Connectivity for Device Integration", Nano Letters 11 (2011) 2304-2310.