

Etched heavy ion tracks in polycarbonate as template for copper nanowires

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30 and 40 μm thick polycarbonate foils were irradiated with Au^{197} and Pb^{208} ions of kinetic energy 1–2 GeV with fluences between 10^6 and 10^9 ions/ cm^2 . The latent tracks generated by the heavy ions were chemically etched providing membranes with cylindrical pores of diameters between 30 and 200 nm. These membranes have been used as templates for the creation of metallic nanowires of very high aspect ratio. A thin metal film deposited on one side of the membrane acted as cathode in the two-electrode electrochemical cell, while a copper cone served as anode. The wires were grown potentiostatically. The electrochemical process was monitored by registering chronoamperometric curves for different cathode overvoltages, temperatures and concentrations of the electrolyte. Under suitable conditions, single-crystalline needles were produced. The morphology and crystallinity of the copper nanowires were studied by means of scanning electron microscopy (SEM), transmission electron microscopy (TEM) and X-ray diffraction.