

Electrochemical fabrication of single-crystalline and polycrystalline Au nanowires: The influence of deposition parameters

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We report the electrochemical growth of gold nanowires with controlled dimensions and crystallinity. By systematically varying the deposition conditions, both polycrystalline and single-crystalline wires with diameters between 20 and 100 nm are successfully synthesized in etched ion-track membranes. The nanowires are characterized using scanning electron microscopy, high resolution transmission electron microscopy, scanning tunnelling microscopy and x-ray diffraction. The influence of the deposition parameters, especially those of the electrolyte, on the nanowire structure is investigated. Gold sulfite electrolytes lead to polycrystalline structure at the temperatures and voltages employed. In contrast, gold cyanide solution favours the growth of single crystals at temperatures between 50 and 65 °C under both direct current and reverse pulse current deposition conditions. The single-crystalline wires possess a [110] preferred orientation.