Synthesis of nanowires

Growth mechanism and crystal orientation of Silver nanowires

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The effect of deposition potential and temperature on the crystal orientation and growth of Ag nanowires have been studied by XRD and SEM. Ag nanowires deposited at -0.1V to -0.6V are single crystals that grew along [110] direction, and are poly-crystalline when deposited at -1.0 V. The large critical nucleus and slow nucleation rate at low potentials can be responsible for the growth of single crystals. The reason for the growth along the [110] direction can be attributed to the dehydration occurring dominantly on the (110) surface of Ag. The poly-crystalline growth can be related to the small critical nuclei and fast nucleation rate at high potentials. The appearance of the (111) peak can be caused by the rotation of grains that are along the [110] direction during growth. At -0.2V and different temperatures (15^0C to 60^0C), the preferred growth plane is (220). The effect of bath temperature at same potential is also briefly discussed.