Effect of Stationary Magnetic Fields on Zinc Oxide Nanowires

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The ability to control the growth of zinc oxide nanowires is important for such applications as field emission electron sources, chemical sensors, and optoelectronic devices. In field emission, taller nanowires produce the most emission current. To achieve this emission current there is a optimal surface density for the height of the nanowire. Surface density is also critical in nanowire-based chemical sensors. The maximum sensitivity is directly dependant on nanowire size and spacing. Finally, the material properties of zinc oxide make it attractive for use in optoelectronics. The ability to grow zinc oxide nanowires of a specific size makes them even more useful. This experiment investigated the effect of a magnetic field on zinc oxide nanowire growth. To initiate zinc oxide nanowire growth, an aluminum foil substrate was seeded with zinc oxide crystals. A series of growth runs were done in a aqueous solution of zinc nitrate hexahydrate(ZNH), hexamethylenetetramine (HMTA) and polyvinylpyrrolidone(PVP) for each scenario. The tests demonstrate that the magnetic field orientation relative to the growth direction of the nanowires caused differences in the nanowires dimensions, structure and surface density. Both nanowires and several other nano structures were observed. When the magnetic field is perpendicular there is very little nanowire growth. The nanowires grown without a magnetic field present are measurably thinner than the nanowires grown with a magnetic field present.

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