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Preparation and Formation Mechanism of Nano-Mg Materials Prepared by Physical Vapor Deposition

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The magnesium nanoparticles, magnesium nanowires, as well as magnesium nanoporous materials have been successfully prepared by a physical vapor deposition method. The results show that by using inert gas condensation device the magnesium nanoparticles are prepared at the evaporation temperature of 773 K. The nanoparticle size is about 10–50 nm in diameter with the morphology of chain structure. By using vapor deposition device, the magnesium nanowires and magnesium nanoporous materials are prepared. $[[11-20]]$ -oriented magnesium nanowires are obtained at 703 K, with the length of about 1.6 μm and diameter of about 75 nm. The magnesium nanoporous materials are obtained at 723 K, with the substrate perpendicular to vapor direction. The diameter of nanopore is about 280 nm and the porosity is about 10.5%. The formation mechanisms of these nano magnesium are explained based on the classical crystal growth theory.

Keywords: physical vapor deposition method, nanoparticles, nanowires, nanoporous materials, formation mechanism.