

142n Fabrication of Magnetic Nickel-Tungsten-Phosphorus Particles by Electroless Deposition

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Nickel-tungsten-phosphorus (Ni-W-P) particles with an average size of ca. 200 nm were fabricated by electroless deposition (ED) on silica particles and Au seeds. For ED processes to proceed on silica surface, a thin Au shell of ca. 5nm is introduced at first for Ni-W-P to grow subsequently. TEM, SEM equipped with EDX, Vibrating Sample Magnetometer (VSM), SQUID and FT-IR were employed to characterize the as-deposited Ni-W-P nanoparticles. It is found that a less deposition temperature near 70,°C is sufficient to deposit Ni-W-P particles, in contrast to 90,°C required for the Ni-W-P deposition on planar substrates. EDX and FT-IR confirms that Au has been covalently deposited onto silica. The nickel-content in as-deposited Ni-W-P particles is around 90% by weight. The magnetization curve for the Ni-W-P particles shows no hysteresis, though nickel is known to be ferromagnetic. Magnetic properties of these Ni-W-P particles are profoundly influence on the P-contents in these particles. The Curie temperatures of these particles are around 300 K, whereas saturation magnetization ranges from 0.1 to 20 emu/g.