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Synthesis and Magnetic Properties of Cobalt Carbide Nanoparticles YAJING ZHANG, GIRIJA CHAUBEY, CHUANBING RONG, NARAYAN POUDYAL, PO-CHING TSAI, J. PING LIU, Department of Physics, University of Texas at Arlington, YONG DING, SMCE, Georgia Institute of Technology —
Co-based alloys and compounds have wide applications in traditional and advanced materials. Co_nC (n=1-6) thin film and bulk materials have drawn much attention and been studied experimentally though less report can be found in studies of their magnetic properties. We report synthesis and characterization of cobalt carbide (Co_3C and Co_2C) nanoparticles by a one-pot polyol reduction process. Tetraethylene glycol was used as both the solvent and reducing agent, and polyvinylpyrrolidone (PVP) as the surfactant. It is found that the size, structure and magnetic properties of the product can be controlled by adjusting the reaction parameters, such as the heating rate, the concentration of NaOH and PVP. PVP plays an important role in controlling the particle size, and therefore magnetic properties. By changing the concentration of PVP, the particle size can be adjusted from 1 micrometer to 20 nm and the coercivity reaches to the maximum value of 3.2 kOe at room temperature when the size was reduced to 20 nm. Thermomagnetic measurements showed that the Curie temperature of the cobalt carbide nanoparticles is around 500 K. Decomposition of the carbides was observed at about 700 K at which the cobalt carbides decomposed into pure Co during measurement.

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