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Synthesis, properties and applications of Mn, Co, Ni and Cu chalogenide nanoparticles

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2011-03-07
http://hdl.handle.net/10539/9108

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ABSTRACT

Herein we report on different synthetic strategies of magnetic semiconductor nanoparticles and we probe their optical, electrical and magnetic properties as well as review some of the possible application of these materials. Metal sulfides and selenides of magnetic metal ions are of particular interest in our study as a result of their dual properties i.e. good optical properties (absorption in: UV for MnS/Se, visible for NiS/Se and IR for CoS/Se and CuS/Se and the ability to emit light) as well as their magnetic properties. The thesis is presented in the form of seven chapters. Chapter 1 gives the background to the physics, syntheses and growth mechanisms of semiconductor nanoparticles. Chapter 2 is presented as the preliminary study to the synthesis and characterization of all the metal sulfides and selenides. Two methods of syntheses are identified as promising for the preparation of both the sulfides and selenides i.e. the single-source precursor and modified hydrothermal methods. These methods and variation of synthetic conditions are further explored in the successive chapters (3-6). The reported nanoparticles displayed good optical, magnetic and electrical properties and subsequently some of the applications relating to these properties are discussed. On the other hand though the synthetic methods are simplistic and inexpensive, further optimization of the reaction parameters is required and suggestions are proposed in chapter 7 as future work.