

Chemical Approaches toward Tera-level Nanomaterials

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Abstracts

In the nanoscale regime, the size and shape of materials strongly influences their chemical and physical phenomena such as catalytic, electronic, and magnetic properties. Most fascinating aspects of nanomaterials is associated with the novel properties under quantum mechanical regime.

In this presentation, the basic concepts of “bottom up” approaches of chemistry based “molecular nanosystem” will be introduced. The examples are ‘solid solution’ and ‘core-shell’ types of well-defined Co-Pt based nanoalloys smaller than 10nm synthesized by redox transmetalation. In this reaction, the redox transmetalation are selectively observed only if the redox potential between two metals is favorable. The composition of the magnetic alloys can also be tuned by adjusting the ratio of reactants. Annealed core-shell nanoparticles transformed into mixed nanoalloys with face centered tetragonal (fct) structures, which show large coercivity and ferromagnetism at room temperature. These nanoparticles can potentially be used as an independent single magnetic bit of tera-bit information storage. Also, this kind of redox transmetalation reaction can be utilized as a general process to synthesize various types of nanoalloys with controlled composition in a selective fashion.