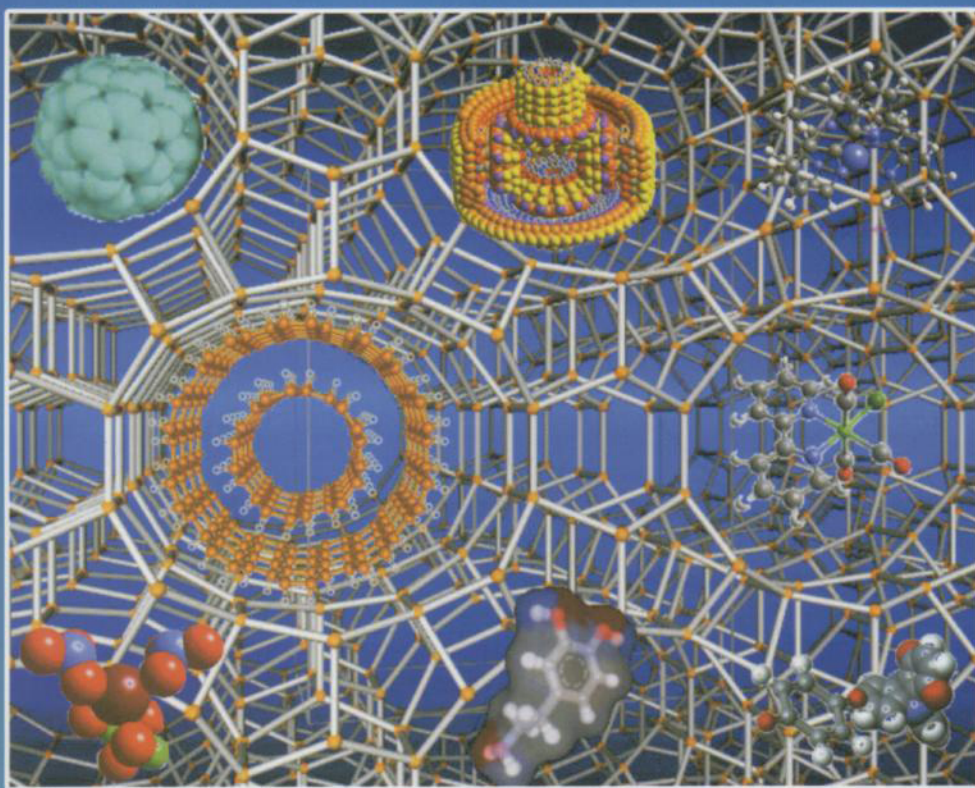


*The 8<sup>th</sup> International Symposium  
on Nanocomposites &  
Nanoporous Materials (ISNNM8)*

February 22 - 24, 2007  
Jeju HAEVICH I Resort



High Performance Nano Composites Program  
Nano Center for Fine Chemicals Fusion Technology  
Research Center for Nano Catalysis  
Environment-friendly Materials Research Center  
The Korean Powder Metallurgy Institute

## Chemical Synthesis of Multifunctional Nanocomposite Materials

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The trends toward device miniaturization have led to increased interest in combining electronic and magnetic properties into multifunctional materials, so that a single device component can perform more than one task. The coupling between ferromagnetism and ferroelectricity results in magnetostriction and the consequent application of piezomagnets as magnetomechanical actuators. Here, we report the synthesis of multifunctional nanomaterials with different materials and with different properties; these include ferroelectric YMnO<sub>3</sub>, and mixed multiferroic materials such as CoFe<sub>2</sub>O<sub>4</sub>-YMnO<sub>3</sub>, Fe<sub>3</sub>O<sub>4</sub>-YMnO<sub>3</sub>, CoFe<sub>2</sub>O<sub>4</sub>-Cd<sub>0.85</sub>Zn<sub>0.15</sub>S, and Fe<sub>3</sub>O<sub>4</sub>-Cd<sub>0.85</sub>Zn<sub>0.15</sub>S nanocomposite by using chemical synthesis process. To demonstrate the design of nano materials, we show the simple synthesis process and microstructure of various nanocomposites for different materials and properties through the chemical method. Through precise control of the synthesis parameters, composite nanoparticles with different morphologies are all obtained with a high yield. The obtained monodispersed nanoparticles and nanocomposite may bring promising applications for multifunctional device and provide a useful guide for future design of nanoscale materials.

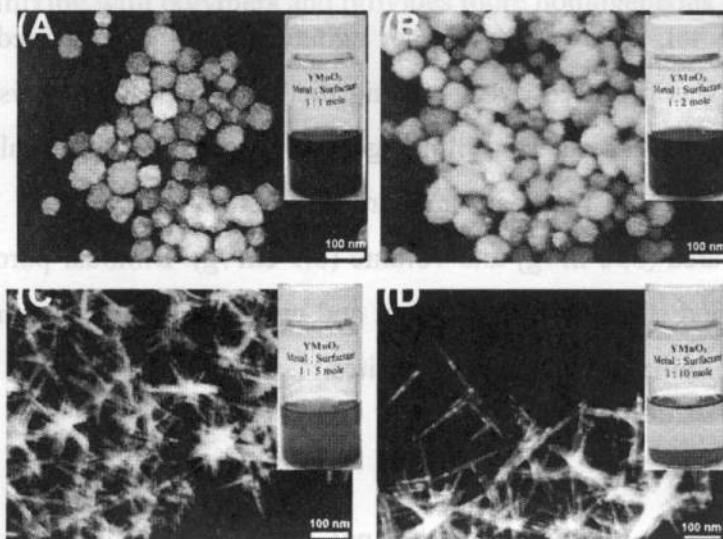


Figure 1. Low magnification TEM images of YMnO<sub>3</sub> with metal(Y and Mn) and surfactant (Oleic acid and Oleylamine) mole ratio and 10 ml samples: (A) 1:1, (B) 1:2, (C) 1:5, (D) 1:10.