Editorial

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Editorial Note on Magnetic Nanoparticles

Anusha K J*

Department of Biotechnology, Bengaluru

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***Corresponding author:** Anusha KJ

anushakj28@gmail.com

Department of Biotechnology, Bengaluru.

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Editorial

At the atomic and fundamental scales, Nano scale science and engineering provide us with unparalleled knowledge and control of matter. In particular, due to their exceptional electrical, optical, and magnetic properties that are often different from their bulk counterparts, they have attracted considerable consideration.

These materials have raised significant interest over the last decades, both in basic research and in future industrial applications. For a broad range of practical applications, such as magnetic industries, optical devices, electronics, biomedical applications, and biotechnology, they have been used or presented. Fortunately, how to design and prepare the desired structure with the desired multifunctionality is one of the most significant challenges in the synthesis of Nano scale materials. As an important family of Nano scale materials, Core-Shell (CS) or dumbbell Magnetic Nanoparticles (MNPs), Due to their unusual functionality, structures of the dimer form have attracted growing attention, largely due to the combination of interesting physical properties in the same nonentity. In addition, quasi-one-dimensional nanostructured materials such as single magnetic nanowires, nanotubes and core-shell nanowires are further extending their capabilities.

A very exciting structure combining various materials, properties and functionality into a single unit is represented by core-shell nanomaterials. For basic science and technical applications, such as biomedicine (in vitro and in vivo), high density magnetic recording, among others, these materials have attracted considerable interest. The key problem, however, is the precise control and tunability of the core and shell size and the chemical composition of both. In addition, the preparation of nanoparticles and nanowires of two different materials meeting each other across a small area is also a daunting task. Significant attempts have been made to monitor the scale, structure, shape and crystallinity in the chemical synthesis of nanoparticles today, but the field is still in its premature stage.

Continuous advances in characterization techniques, as well as advances in chemical paths, allow more and more complex structures to be produced whose physical properties are yet to be understood. In reality, the rapid pace of technological progress results in the need for tunable devices with controlled nanostructures to be developed, Even if the dynamic magnetic response of the novel systems is not completely understood. These structures, in particular, show a very complex magnetic behavior that is definitely the product of, among others, surface effects, magnetic interactions, and size effects. Each novel framework represents a new challenge from the fundamental point of view, further expanding this fascinating field.