Assembly of Nanoscale Building Blocks to control the Collective Magnetic Behavior

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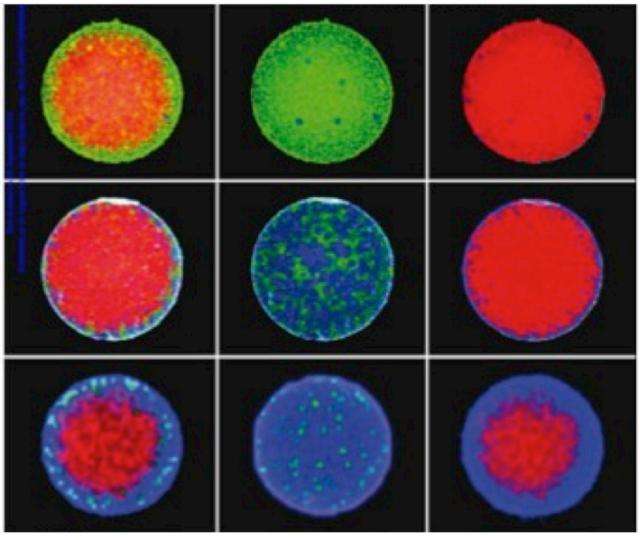
Not long ago, controlled synthesis of nanoparticles with a new composition was considered a substantial advance in nanoscale science. Nanotechnology however has reached the stage of development where the subject of most investigations is not individual nanoparticles or nanowires but rather systems of much greater complexity. [1] In magnetic systems, the focus of synthetic efforts appears to be shifting to creation of secondary structures of nanocrystals, in order to tie together the intrinsic properties of the individual constituents (M_S, K_1, etc.) and the collective properties of the final composites (dipolar interactions, grain-boundary or exchange-coupling effects between the subunits forming them), as both aspects play important roles.

Thus, the concept of a collective behavior of nanoparticles and hybrid nanoscale systems is transitioning from pioneering studies to “proof of concept” applications. We will go through several examples that demonstrate the assembly of nanoscale building blocks to exert the control of the final collective magnetic behavior [2] and the possible diversity of the ultimate functionalities of these complex nanomaterial systems. This fascinating approach of artificial nanostructuring permits to create completely new ever-progressing magnetic materials. These applications include such far-reaching challenges as biological sensors [3] or catalysts. [4]

References

[1] V. Salgueiriño-Maceira, M. A. Correa-Duarte, Advanced Materials, **19** (2007), 4131-4144.
[2] M. Sanlés-Sobrido, M. Bañobre-López, V. Salgueirino, M. A. Correa-Duarte, B. Rodríguez-González, J. Rivas, L. M. Liz-Marzán, J. Mater. Chem. **20** (2010), 7360-7365.
[3] A. B. Dávila-Ibáñez, M. A. López-Quintela, J. Rivas, V. Salgueirino J. Phys. Chem. C **114** (2010), 7743-7750.
[4] A. B. Dávila-Ibáñez, M. A. Correa-Duarte, V. Salgueirino J. Mater. Chem. **20** (2010), 326-330.

Figures



STEM elemental mapping through XEDS analysis for PS/Pt/Ni composite particles with different magnetic content.