

“Nanocomposites and nanomaterials”

Nd-Fe-B nanoparticles prepared by cryomilling.

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Nd-Fe-B based nanoparticles with controllable particle size, aspect-ratio and phase composition have been long desired in various applications such as renewable energy technology, electronics and aerospace science. However, traditional relatively immature synthetic strategies will lead to either moderate magnetic properties or irregular morphology, which limited their wide applications. In this paper, we present a low-temperature milling approach to prepare spherical single domain Nd₂Fe₁₄B nanoparticles with average size tunable from 25 to 80 nm (Fig. 1). Out of many synthesis parameters, the study emphasizes the role of Ar atmosphere which not only serves as a protecting agent, but also critically influences the chemical homogeneity and size of the particles. The isotropic wax compacted powders exhibit an intrinsic coercivity of 200 kA/m. These single grain Nd₂Fe₁₄B particles can be combined with nanosized soft phase in order to prepare high energy density exchange-coupled nanocomposite magnets.

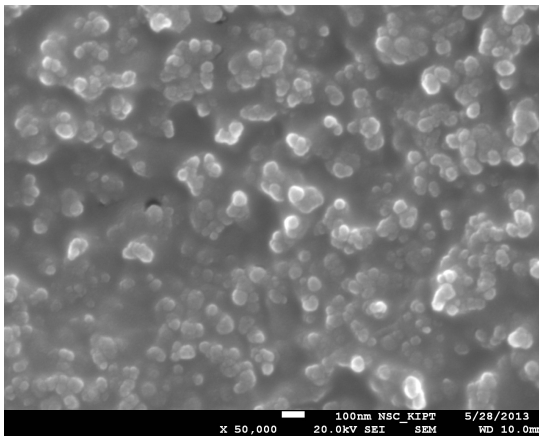


Fig. 1 SEM image of cryomilled Nd₂Fe₁₄B nearly spherical nanoparticles