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Simulation of magnetic coupling in die-upset composite magnets[1]

GEORGE HADJIPANAYIS, ALEXANDER GABAY, Department of Physics and Astronomy, University of Delaware — Die-upset composite magnets fabricated from blends of melt-spun Nd-Fe-B ribbons and coarse (micron-size) soft magnetic powders (Fe, Fe-Co) exhibit uniform magnetization behavior despite the fact that the soft magnetic inclusions are too large to be magnetically coupled through inter-phase exchange interactions. In this study, we present the results of numerical simulation showing that in the case of a layered microstructure (typical of the die-upset composites) the long-range magnetostatic interactions assure smooth demagnetization curves. Still, at least partial exchange coupling is required to have an increased remanence. It is argued that the effect of magnetostatic coupling in composite magnets with a layered morphology considerably relaxes the strict requirements for the size of the soft inclusions and it may facilitate the future development of high-performance composite anisotropic permanent magnets.

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