

# Application of nonequilibrium concentration profiles in particle diffusion under the action of a magnetic force (abstract)

J. J. M. Janssen, H. W. Myron, and J. A. A. J. Perenboom

*High Field Magnet Laboratory and Research Institute for Materials, NL-6525 ED Nijmegen,  
The Netherlands*

For submicron particles diffusion effects and interparticle interactions cannot be neglected in studies of particle behaviour under the action of a magnetic force. Several authors have studied the case of single wire HGMS, where these effects lead to the phenomenon of dynamic buildup: a concentration gradient is induced, but no actual capture occurs. Applications are in, e.g., magnetohydrodynamic separation<sup>1</sup> and susceptibility selective separation.<sup>2</sup> These applications are based on the equilibrium situation. We have studied the case of nonequilibrium concentration through a numerical solution of the time-dependent diffusion equation, and have found interesting features, that may lead to new applications. The magnetic force will cause a depletion of (ferro)magnetic particles at one end of the sample cell at a size-dependent speed. Observation of the time evolution of the particle concentration at some distance from the end of the cell will then allow to deduce the particle size distribution.

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<sup>1</sup>U. Andres, *Minerals Sci. Eng.* 7, 99 (1975).

<sup>2</sup>J. Y. Hwang, M. Takayasu, F. J. Friedlaender, and G. Kullerud, *J. Appl. Phys.* 55, 2595 (1984).