V. P. KRAVCHUK [1], Y. B. GAIDIDEI [1], D. D. SHEKA [2]

Curvature effects in thin magnetic shells

[1] *Bogolyubov Institute for Theoretical Physics, Kyiv, Ukraine*
E-mail: vkravchuk@bitp.kiev.ua
[2] *National Taras Shevchenko University of Kyiv, Ukraine*

Recently the equations of magnetization dynamics were derived for a couple of certain curvilinear cases: cylindrical[1] and spherical[2] geometries. Here we propose a general theory[3] where the equations of the magnetization dynamics are derived for an arbitrary curved thin shell in the assumption that the magnetostatic effects can be reduced to an effective easy-surface anisotropy. General static solutions are obtained in the limit of a strong anisotropy of both signs (easy-surface and easy-normal cases). It is shown that the effect of the curvature can be treated as appearance of an effective magnetic field which is aligned along the surface normal for the case of easy-surface anisotropy and it is tangential to the surface for the case of easy-normal anisotropy. In general, the existence of such a field denies the solutions strictly tangential as well as strictly normal to the surface. As an example we consider static equilibrium solutions and linear dynamics for a cone surface magnetization.

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