9.7 cm

Spin waves localisation in 2D square magnetic nanodots and its influence on the stability of the Landau state

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We use a microscopic theory with dipolar and nearest-neighbour exchange interactions taken into account to explore spin-wave excitations in two-dimensional magnetic nanodots with the Landau state (closure domain structure) assumed as a ground state. We study the effect of a hole introduced at the centre of the dot on the spin waves localization and the ground state stability. We calculate the spin-wave frequencies vs. the dipolar-to-exchange interaction ratio d to find its range for which the assumed state is stable (no zero-frequency modes in the spectrum). The magnetization profile of the lowest-frequency mode provides us information about the character of the ground state transition. In square dots the removal of only one spin at the centre makes Landau state more stable, i.e. transition to different ground state appears for lower d (stronger exchange interactions). Increasing of the size of the hole does not result in additional stabilization. In contrary for in-plane vortex in circular dots we found strong dependence of critical d on the size of the hole. We show this effect origins from the edge roughness.
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