The influence of the demagnetizing field on the concentration of spin wave energy in two-dimensional magnonic crystals

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We use the Plane Wave Method [1] to theoretically study thin-film magnonic crystals (MCs) composed of two very common magnetic materials, namely cobalt and permalloy, in both cases: Co inclusions in the Py matrix and Py inclusions in the Co matrix. The external magnetic field applied in the plane of such structure causes the appearance of a demagnetizing field at the interface of inclusions and matrix. It has already been shown that this field strongly influences the spectrum of spin waves, e.g. the position and width of bandgaps [2-3]. In this work, we use the in-plane squeezing of the MC structure to enhance the demagnetizing field, resulting in the transfer of the energy distribution (i.e. the spin-wave profile) of low-frequency spin waves from Py to Co. The change of the concentration of spin-wave profiles leads to some peculiarities in the spin-wave frequency spectrum, such as modes repulsion caused by their hybridization and resulting in their reordering in the spectrum.

References:

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