MAGNONIC BAND STRUCTURE OF PERIODIC (ONE AND TWO-DIMENSIONAL) COMPOSITES

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9.7 cm

Following Yablonovitch's papers, reporting experimentally the existence of an absolute frequency gap in the spectrum of electromagnetic waves propagating in a periodic dielectric structure (a photonic crystal), there have appeared papers which - by analogy to photonic crystals - dealt with the possibility of the existence of complete energy gaps in the spectra of other excitations propagating in periodic macrostructures. Recent papers investigate the magnon spectrum of a two-dimensional composite consisting of cylindrical ferromagnetic rods, periodically disposed as a two-dimensional lattice embedded in a homogeneous medium with magnetic properties differing from those of the cylinders. These studies showed that the magnonic spectra of the composite can exhibit frequency regions forbidden for the propagation of magnon excitations, and those forbidden energy gaps were found to be sensitive to the exchange contrast between the constituent materials and to the contrast of their magnetizations; both the magnetization as well as the exchange contrasts become gap-creating factors. We study in detail the dependence of the widths of the respective gaps obtained in the magnonic spectra of ferromagnetic supperlattices as well as two-dimensional ferromagnetic composites - on different parameters characterizing the magnetic structure under investigation.

13.4 cm

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