Spin wave dynamics in magnonic crystals, quasicrystals and areas of graded refractive index

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Spin waves (SW) frequencies in ferromagnetic materials span the range from hundreds of MHz up to tens of GHz, with the respective wavelengths ranging from micrometers to nanometers. Within these time and space limits SWs can be used for transferring and processing information, and microwave applications. We present our recent advances allowing for manipulation of SW dynamics in ferromagnetic thin films. We interpret SW band structure in magnonic crystals, explain formation of the magnonic band gaps, variation of the band structure resulting from changes in the magnonic crystals geometry, and show their possible utilisation. Quasiperiodicity in magnonics show additional SW properties, which are relevant for technological applications, feasible for transmission signals, and the band structure with multiple band gaps and localized modes that have valuable responds on the uniform microwave field. Further control of SW propagation is achieved by continuous change of the SW refractive index. The results point out an opportunity for developing metamaterials for microwave applications and nanostructures for processing information in nanoscale.

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