

Bulk and surface magnetoelastic waves

P. Graczyk,¹ Jarosław Kłos,¹ and Maciej Krawczyk¹

¹*Faculty of Physics, Adam Mickiewicz University,
Umultowska 85, 61-614 Poznań, Poland*

We will present the existence of broadband magnetoelastic waves in optimized one-dimensional periodic structure (magphonic crystal). The system consists of two ferromagnetic layers alternating in space. We have taken into consideration materials prominent in magnonics: YIG, CoFeB, permalloy, and cobalt. The coupled mode theory (CMT) formalism have been successfully implemented for the first time to describe magnetoelastic interaction as a periodic perturbation in the magphonic crystal. We have demonstrated how the energy is spatially exchanged between spin wave and acoustic wave in the magphonic crystal if the resonance condition is satisfied. We have shown, that CMT analysis of magnetoelastic coupling allows to effectively design a spin wave-acoustic wave transducer based on a magphonic crystal. Moreover, we propose thin film – substrate systems optimized for the experimental investigation of the linear coupling between surface spin waves and surface acoustic waves.

This work was supported by the National Science Centre Poland from grants UMO-2012/07/ST3/00538 and UMO-2016/21/B/ST3/00452