Spin Seebeck detection of magnon-polaron excitations in a nonmagnetic-ion-substituted garnet system

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The spin Seebeck effect (SSE) refers to the generation of a spin current in magnetic materials by the application of a thermal gradient. This spin current generates an electric voltage in a non-magnetic metal attached to the magnet via the inverse spin Hall effect.

Recently, the effect of magnon-phonon hybridization, resulting from the crossing of the magnon and phonon dispersions, has been detected by SSE measurement in Ytrium Iron Garnet (YIG). This is experimentally observed as spikes of the SSE-voltage at the magnetic field values for which the magnon-phonon hybridization is maximized over k-space [1-3].

In this talk, we report the detection of magnon-phonon hybridization in a nonmagnetic-ion-substituted garnet system by means of the SSE. The magnon dispersion can be strongly affected by the nonmagnetic-ion substitutions, thus resulting in a clear modification of the magnetic field condition for the observation of magnon-polarons, with respect to the case of non-substituted YIG. The results demonstrate the SSE as an efficient tool to study the magnon-phonon coupled dynamics in magnetic systems.

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