Thermomagnetic and thermoelectric properties of thin films prepared by sputtering and atomic layer deposition

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Abstract

A temperature gradient in a ferromagnetic device can lead to a transverse voltage perpendicular to the magnetization and the heat current [1]. This thermomagnetic effect, so called anomalous Nernst effect (ANE), is considered to be equivalent to the magnetization [2]. In recent day, however, many experiments suggested various contributions to the ANE arising from the non-trivial topology of particular materials. To identify the origin of the ANE, an accurate measurement scheme need to be adopted.

Although, there are various methods to fabricate thin films and measure ANE, the values of anomalous Nernst coefficient in literature vary significantly. One of the reasons might be inaccurate estimation of the applied thermal gradient.

In this study, we demonstrate a model experiment of measuring ANE in a custom setup. We sputter ferromagnetic thin films, Co₂Fe₂B and Co₂MnGa. The fabricated devices enable generation of a well defined thermal gradient and detection of thermomagnetic properties in the same time. The described experiment allows for more accurate anomalous Nernst coefficient evaluation. This platform for TE measurements can be applied to 2D materials in the future.

References


Graphene2018 June 26-29, 2018 Dresden (Germany)