Identification of magnetic anisotropy axes using thermomagnetic Nernst effect

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Thermomagnetic and thermoelectric effects are attractive due to their potential applications involving the direct conversion of waste heat into electrical energy [1]. Currently, only a few thermoelectric effects can be applied in ultra-low-power thermoelectric generators and transducers. The most widespread are semiconductor devices exploiting Seebeck-Peltier-Thomson effects. Thermomagnetic effects like Nernst [2], Ettingshausen [3], or spin-Seebeck [4] are still under scientific study. The Nernst effect is one of the thermomagnetic effects that can be also potentially used in direct converters of thermal energy into electrical energy [5,6]. The state of the art of research on the Nernst effect will be presented. The paper will show experimental research and discussion of results showing the influence of magnetic anisotropy of soft magnetic structures on the thermomagnetic Nernst effect [7]. The effect was investigated in several samples made of high magnetic permeability Fe-containing alloys. The samples with 20x4x0.2mm were tested in a transverse arrangement, i.e. in which the magnetic field vector was applied transversely to the temperature gradient [8]. The studies were performed for several values of temperature in the range from 293K to 320K. The experimental results reveal a significant impact of structural and micromagnetic order on electric field potential caused by the presence of the Nernst effect.

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