Numerical Modeling of a MEMS Sensor with Planar Coil for Magnetic Flux Density Measurements

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Abstract

The silicon cantilever with the planar coil was applied to the magnetic flux density measurements. The influence of shape and dimensions of planar coil on magnetic energy density was described. Greatest value of magnetic energy brings bigger force acting on silicon structure (one-side mounted cantilever). In cause of magnetic anisotropy and heterogeneous of analyzed silicon structure the FEM method and couple field method was applied in simulation. The AC/DC Module of COMSOL Multiphysics was used. Micromachined magnetometers have been developed for some time by several authors. The devices measure either the torque induced by the magnetic field in the magnetized material or use the Lorentz force acting on the current-carrying conductor. The Lorentz force based sensors owing to their potentially simpler fabrication and better stability seem to be a better solution. Therefore, the Lorentz-force acting on a microcantilever with the planar winding has been a promising alternative for the measuring of the quasi-stationary and low frequency magnetic fields. The dependence of the beam size on the beam end displacement and its angle as well for the assumed magnetic induction was carried out. Considering the technological requirements the maximum allowable beam sizes were assumed and the influence of these parameters on the angle was analyzed.

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Figures used in the abstract

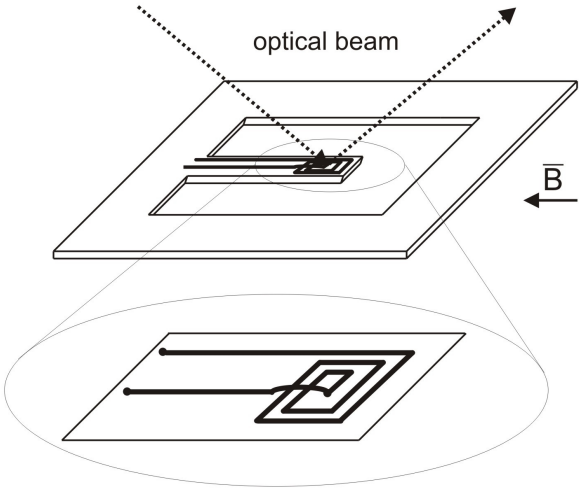

Figure 1