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# Faraday Rotation Materials for Fiber-Optic Magnetic Field and Electric Current Sensors

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Magnetic materials with high Faraday effect were studied for fiber-optic magnetic field and electric current sensor design. Different compositions of semimagnetic semiconductors were grown to measure high-frequency magnetic fields (up to several GHz). For moderate-frequency sensors ($<50$ MHz) the most promising material was found to be Bi-substituted yttrium-iron garnets. Several ways to achieve high sensitivity and wide frequency bands are discussed. Sensors based on the investigated materials for various areas of applications were constructed.

## 1. Introduction and Sensor Construction

For many years, problems in magnetic field and electric current measurements have been very important issues in different areas of science and technology. Different methods are used to measure these quantities. All of them are based upon monitoring the changes produced by magnetic fields in certain materials.

Use of the Faraday effect is the most promising for nondisturbing, wide-band registration of magnetic fields and electric currents. The Faraday effect is a well-known linear magnetooptical phenomenon of light polarization rotation caused by a magnetic field in a material.

Sensors based on the Faraday effect can be easily incorporated in conventional