Magneto-Optic Fiber Bragg Grating
Tech ID: 23552 / UC Case 2012-060-0

SUMMARY
Professor Greg Carman of the UCLA Department of Mechanical and Aerospace Engineering and colleagues at NASA's Armstrong Flight Research Center have developed a method to couple multiferroic and optical behaviors in fiber Bragg gratings to detect minute changes in temperature or magnetic fields.

BACKGROUND
The past decade has seen the development of optical fiber Bragg grating (FBG) sensors to measure physical quantities such as temperature, strain, and pressure. The high precision of this general approach has led to many field-coupled coatings being developed to create entirely new sensor systems. To illustrate, a palladium-coated FBG robustly senses hydrogen, which can be used for alternative energy applications.

However, a more significant unmet need is a FBG coating that detects minute changes in temperature and magnetic fields. Current FBG-based methods for this application detect minute changes in temperature and magnetic fields. Current FBG-based methods for this application detect external fields via strain, Faraday-effect materials, or ferrofluids. But, this additional step introduces extraneous thermal and mechanical influences. An invention that bypasses this would be a strong candidate for integration into sensing systems used in a variety of industries, including homeland security, navigation, and mineral exploration.

INNOVATION
The inventors have developed a method to couple multiferroic and optical behaviors in fiber Bragg gratings. By directly coupling the external field to the electromagnetic wave propagating in the FBG-containing fiber, the invention significantly improves on the current state of the art, offering greater sensitivity, compactness, and signal resolution.

APPLICATIONS
▶ Military/security: detection of explosive devices
▶ Navigation: backup for satellite GPS, altitude sensing
▶ Mineral exploration
▶ Geophysical surveys
▶ Oil and gas drilling
▶ Use as an optical switch or selective filter activated by a known magnetic field

ADVANTAGES
▶ Readsily integrated into optical circuits that cannot accommodate bulk field-coupling actuators
▶ Lighter and more compact than conventional EM field devices
▶ Direct coupling between external field and EM wave reduces extraneous thermal and mechanical influences

STATE OF DEVELOPMENT
The invention has been successfully fabricated and characterized over a relevant temperature range.

PATENT STATUS

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<td>United States Of America</td>
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<td>9,274,181</td>
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RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
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