Abstract

With hopes of developing a magnetically sensitive optical fiber, one can use the Brewster’s and Critical Angle Tests as a way to characterize magnetic nanoparticles embedded in translucent thin films. These tests are used to determine the refractive index of the magnetorefractive composite structures with high precision. Two experimental setups were used to characterize the composites, one under an externally applied magnetic field and one without, to determine if a discernable alteration in the index of refraction could be observed as a function of field strength.

Materials And Methods

Cores & Shells

Oscilloscope

Sol-Gel Sample

Types of Tests

Brewster’s Angle Test

Critical Angle Test

Magnetic Comparison Tests

Results

Brewster’s Angle Test of Glass Substrate

Critical Angle Test of Tape Substrate

Brewster’s Angle Test of BaM on Glass with H= 0.00 T

Brewster’s Angle Test of Glass with H= 0.45 T

Brewster’s Angle Test of BaM on Tape

Brewster’s Angle Test of BaM on Glass with H= 0.45 T

Conclusion

• We characterized the index of refraction of several sol-gel composites
• The BaM-SiO2 saw a less than 0.1% change in refractive index with a 0.45 T applied magnetic field (statistically insignificant)
• We recommend re-evaluating the BaM samples using a 1550 nm laser and a larger magnetic field

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