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Measurement of Kerr rotation and Fresnel reflection coefficients using a rotating polarizer method

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Abstract: The magneto-optical Kerr effect (MOKE) occurs when polarized light reflects from a magnetized surface, causing a small change in the polarization angle and state. Measurement of the complex Kerr angle is well established and typically performed close to the null configuration in a polarizer-analyzer geometry[1]. In this work, we developed a method to measure the Kerr rotation and Fresnel reflection coefficients by varying the incident beam polarization angle and measuring the s- and p-polarized reflected light intensities using a Wollaston prism. We will present a Jones Matrix analysis of our setup as a function of the incident polarization and fit the equations to our experimental MOKE hysteresis loop data. In addition to being a multi-point analysis method, this process allows us to measure the Kerr rotation and the Fresnel coefficients, including the magneto-optic reflection terms. Using cobalt thin film as an example, we estimated the Kerr rotation of 1 mrad, |rp/rs|= 0.77, and |rps/rs|=0.12 at a 45-degree angle of incidence. Such values will be compared with the literature and presented.

Biography: Ryan Molitor has an Associate's of Science in engineering from St. Charles Community College. A Bachelor's of Science in physics and astrophysics from the University of Missouri-St. Louis. A Master's of Science in physics from Southern Illinois University-Carbondale. Since 2015 to 2025, he has been invited to the Congress of Future Science and Technology Leaders, attended the NASA Missouri Space Grant Consortium, attended the 7th Institute of Molecular Science Education (I-COMSE), and attended the 77th International Symposium on Molecular Spectroscopy (ISMS). He served as a

teaching and research assistant at the University of Missouri-St. Louis Graduate School and teaching assistant at Southern Illinois University-Carbondale Graduate School. He is interested in the motions of the macroscopic universe, motions of the microscopic universe, 3D printing, and engineering.

References;

1. D. H. Suzuki and G. S. D. Beach, Measurement of Kerr rotation and ellipticity in magnetic thin films by MOKE magnetometry, J. App. Phys. **135** (2024) 063901, doi: 10.1063/5.0185341.