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PhD Tentative Research title: Developing integrated quantum photonic in diamond for sensing applications.

Color centers in diamond have emerged as promising candidates for Quantum sensing, especially the Nitrogen Vacancy (NV) centers. Our goal will be towards designing integrated photonic for efficient excitation and collection of optical signals from these color centers. Femtosecond laser writing has emerged as a powerful tool for fabrication of optical and microfluidic components in diamond. In this work, we will be first building up an integrated photonic characterization lab, consisting of fiber optic coupling, guided mode profile measurement, optical loss measurements and basic photoluminescence measurement. COMSOL simulations will be performed to design appropriate photonic structures for waveguiding, directional coupling and Bragg reflection applications. For this project, we will closely work with national and international collaborations, initially to fabricate femtosecond laser inscribed devices in CVD diamond. The laser formed devices will be characterized and used for magnetic field sensing applications from biological Magnetic NanoParticals.

More Information and relevant references can be found in the link:

<https://sites.google.com/view/vibhavbharadwaj/home>

Prerequisites:

- Motivation and enthusiasm to build an optical characterization lab.
- Hands-on-experience with basic optical component alignment such as He-Ne laser, Interferometers and 4f lens systems.
- Basic programming skills.
- Work with fiber optics and COMSOL will be an add-on but not necessary.