Femtosecond laser microfabrication of spiral optofluidic sensor and its sensing applications (MSc Seminar)

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ABSTRACT: Optofluidics combines the advantages of optics and microfluidics to achieve new functionalities. In this thesis, femtosecond laser is explored to study the nonlinear interactions between ultrashort laser pulses and photoresist materials, and the possible applications in optofluidics. Based on the effect of multi-photon absorption occurred in transparent photoresist materials, spiral-shaped waveguides of different specifications are fabricated with femtosecond laser in photoresist SU-8-2. Each of the waveguides, which contains one bus waveguide and one spiral-shaped waveguide with a distinct circumference, can be integrated into one microchannel on a glass substrate to form a spiral optofluidic device as an optofluidic sensor. The sensor with the highest sensitivity is utilized to measure physical properties of various fluidic samples (calcium chloride, cow milk and its related products, non-diary milk, and sucrose). These properties include temperature, refractive index, positive pressure and concentration. All devices have been fabricated with the use of small-sized low-cost materials and easy-to-replicate fabrication techniques. The effectiveness and applicability of the spiral optofluidic devices demonstrated in this thesis revealed the significance of nonlinear optical interactions between ultrashort light pulses and photosensitive materials, and their importance in many applications.

ALL ARE WELCOME!