Condensed Matter Physics Seminar

Department of Physics, National Taiwan University

# What's Matter of Optofluidic Transformation Optics between Light and Liquid


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Dept. of Physics/Center for Condensed Matter

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**All Are Welcome!**

## Abstract


Optofluidics aims at manipulating light and fluid at microscale and exploiting their interaction to create highly versatile devices have received significant scientific interests in many areas. The novelties of the integrated optofluidics are two-fold. First, fluids can be used to carry substances for analysis in highly sensitive optical micro-devices. Second, fluids can also be exploited to control light, making them tunable, reconfigurable and adaptive. In this paper, the state-of-the-art of optofluidic research is reviewed with breakthrough innovations in optical and photonic devices, including the high potential applications of optofluidics in biophysical, biochemistry and biomedical studies [1-3].

Optofluidic transformation optics represents a new paradigm for designing light-manipulating devices, such as cloaks and field concentrators, through the engineering of electromagnetic space using materials with spatially variable parameters. We demonstrate that a laminar liquid flow in an optofluidic channel exhibits spatially variable dielectric properties that support novel wave-focusing and interference phenomena [4]. This work provides new insight into the unique optical properties of optofluidic waveguides and their potential applications. Other demonstrations include evanescent wave sensing based on the optofluidic waveguide as a near-field photonic device [5-6].

Tunable microelectromechanical metamaterials or tunable micromachined metamaterials aim to change the material properties through tuning or reconfiguring the unit element structure size or shapes of the metamaterial. The element structure is changed by the micromachined actuators that are fabricated by silicon deep etching processes. It is significant breakthrough research for the metamaterial to demonstrate new physics phenomena that are never been observed before. In the paper, the different types of tunable micromachined metamaterials will be presented with some industry applications.