FANO RESONANCE IN SELF-ASSEMBELED MICROBOTTLE RESOANTOR

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1. Introduction

Whispering gallery mode (WGM) resonators with high quality-factors (Q) have been used for high-sensitivity refractometric sensing. The sensitivity can be further enhanced by using Fano resonances [1]. Apart from this, Fano resonances are also useful for sub-diffraction focusing in super-resolution microscopy [2]. Here we report the observation of Fano resonances in self-assembled microbottle resonators (MBRs). MBRs are WGM microcavities with highly prolate-spheroidal shape. MBRs show modes that extend along the z-axis of the resonator, known as higher order axial modes or bottle modes. Self-assembly is a simple and robust method to fabricate MBRs. We have self-assembled MBRs made of poly methyl methacrylate (PMMA), a high quality optical polymer, on a tapered optical fibre. The mode spectrum of these self-assembled MBRs show Fano resonances.

2. Fano resonances of self-assembled MBRs

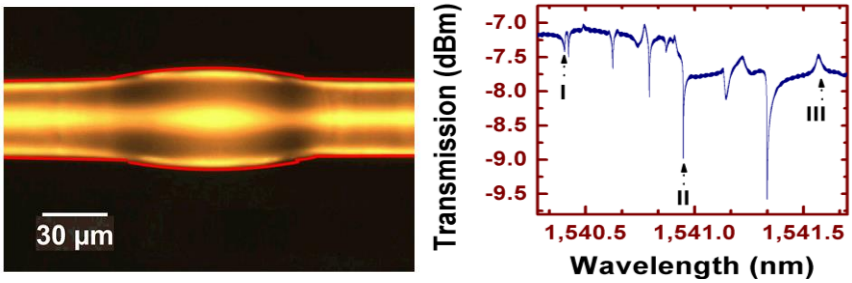

Fig 1. Image of the self-assembled MBR (left). The right panel shows the transmission spectrum of the MBR. Some of the Fano resonances are indicated as I, II, and III.

Figure 1 (left panel) shows a micrograph of self-assembled MBR of maximum radius 17.5 µm. A tapered fibre coupling-setup was used to characterize the mode spectrum of the MBR. The right panel of the figure shows the recorded spectrum of the MBR. The spectrum appears as a series of dips which corresponds to WGM resonance. For example, the peaks indicated as I, II and III have asymmetric profiles-a characteristic of Fano resonances. The Fano resonances are formed due to the interference of a high Q and a low Q WGM. More results and discussions will be presented at the conference.

[1] Z. Chen et al., "Sensing characteristics based on Fano resonance in rectangular ring waveguide" *Opt. Comm.* 356, 373-377 (2015)
[2] S. Chen, S. Jin, and R.Gordon, "Subdiffraction focusing enabled by a Fano resonance", *Phys. Rev. X*, 4, 031021-7 (2014)