Fabrication of Photonic Crystal Chips for Biophotonic Applica

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Stretching luminescent molecules by confinement in nanofluidic channels has attracted a great interest during the last few years for the study of physical and biological properties of these molecules, like DNA [1, 2]. In this work, we present the fabrication of a sealed micro/nanofluidic chip for molecule stretching applications and enhanced fluorophore detection, based on the use of photonic crystal technology combined with anodic bonding of the silicon base and Pyrex cover. The photonic crystal is composed of arrays of nanoholes that enhance light emission (see Fig.1). Fabrication is made by high-resolution focused ion beam (FIB) etching on a 100nm thick Si_3N_4 layer. This layer is on top of a 500-nm thick SiO_2 layer on a Si substrate. Using this chip we have performed fluorescence intensity measurements of a fluorophore inserted in the microchannels. The liquid flows through the nanochannels that have been fabricated with and without the photonic crystals. Enhancements of light intensity up to 2.5 times have been found for the nanochannels with the photonic crystal structures.

References

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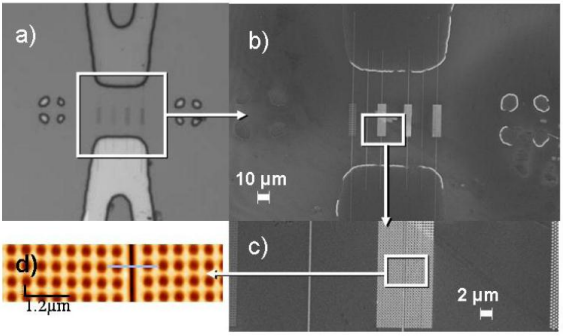

Figure 1: Scanning electron microscopy (SEM) images of the chips fabricated by FIB etching showing greater magnifictions of the areas marked by the white boxes (a ,b and c). The images in (d) is an atomic force microscopy (AFM) image of the area marked by the white box in c).