High sensitivity nanofluidic chips for single molecule detection

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KEY WORDS: fluorescence microscopy, nanofluidics, single molecules, lab on a chip, molecular identification.

ABSTRACT:
Recently we developed novel nanofluidic chips, where the height of the fluidic channels are in the range of ~100 nanometer [1,2]. The nanometer-scale dimension provides high inherent axial resolution for microscopy, and enables the detection of single molecules. Nanofluidic manipulation and sensitive fluorescence detection can be combined to perform the investigation. Micrographs of one of the device in the chips are shown in Figure 1(a), where we did preliminary experiments using fluorescence beads with a diameter of 20nm.
High spatial and spectral resolution limits, both in the manipulation and the detection, are required for achieving quantitative molecular identification [3]. We demonstrate the capability to follow the path of a single molecule, as shown in Figure 1(b), and to estimate the resolution limits of the device. The performance of the device is adequate for actual tests (e.g. genetic aberrations in DNA) that will be performed later.

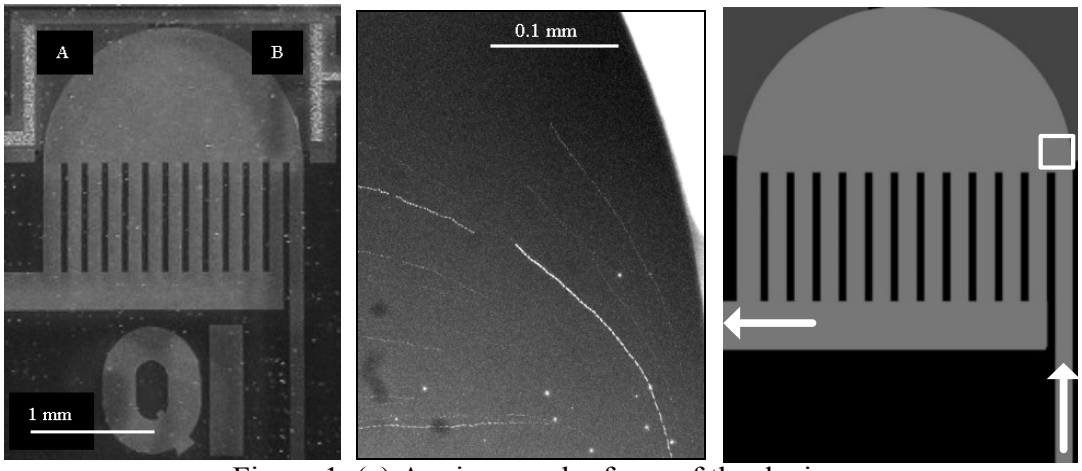

Figure 1. (a) A micrograph of one of the device;
(b) trajectories of the fluorescence beads inside the device;
(c) the schematic of the device, with the rectangle depicts the region of interest shown in (b).

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