Carbon Nanotube sorting strategies using microfluidic channels

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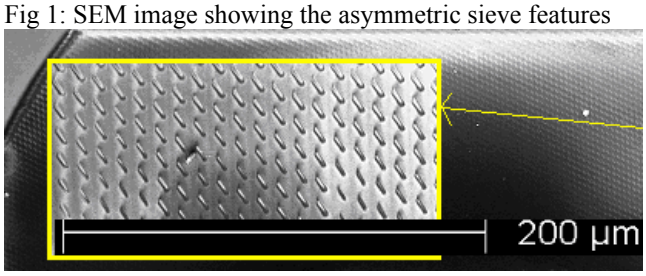
Abstract

Many of the interesting properties of Carbon nanotubes (CNTs) have been hard to exploit because they grow in mixtures of diverse physical and electrical properties. One of the problems is to sort them based on size. We have proposed a sorting mechanism based on diffusivity differences between tubes which is amenable to be used to sort by size, because size and diffusion constant are strongly correlated. This technique employs a Brownian ratchet mechanism that progressively rectifies the diffusion displacements and cause separation with micro-sieves. It is attractive not only because it isolates the separation dependence on the size but also because it can be optimized to achieve good dynamic range to suit the application. For this technique we have fabricated an asymmetric sieve by rapid prototyping a PDMS mold. Preliminary experiments are carried out with different sized beads to be separated.

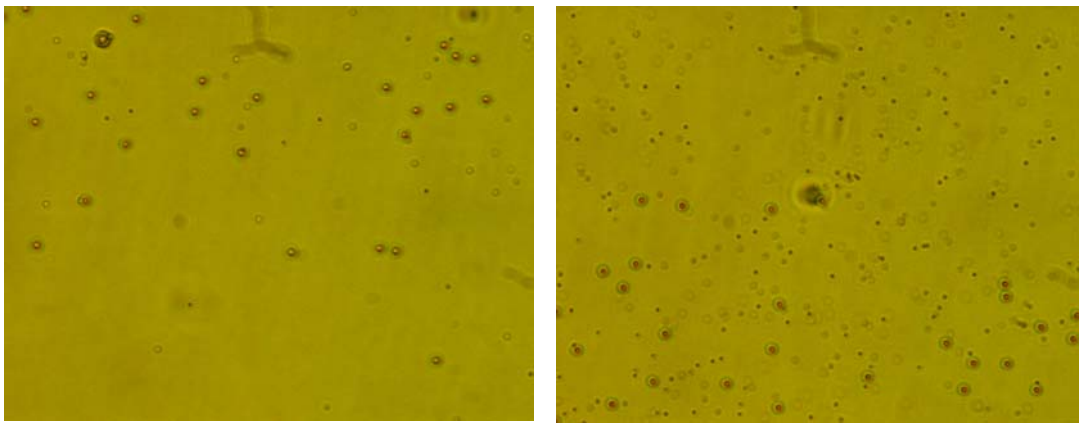
(Image from SEM)

Fig 1: SEM image showing the asymmetric sieve features



(Images from experiments)

The bright field images (40x) shows the asymmetry in the diffusion of the small and large beads



(a) above the obstacles (b) below the obstacles.