Effect of microfluidic channel design on the separation of single-wall carbon nanotubes by dielectrophoresis

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The advantage of dielectrophoresis (DEP)-induced technique used for the separation of single-wall carbon nanotubes (SWCNTs) is no need for chemical modification of SWCNTs for separation. However, separation efficiency of this method has not been comparable to other methods which utilize chemical modifications. One of the reasons for this may be poor microfluidic channel design appropriate for given electrical properties of SWCNTs. Thus, analysis of parameters to enhance DEP force is necessary to improve the separation efficiency. We have calculated trajectory of SWCNTs, fluid velocity and electric field in a channel with various geometries. Here, fluid velocity and electric field are obtained by solving Navier-Stokes equation and Poisson's equation, respectively, using finite element method. Then, they are used to calculate drag force and DEP force which determine trajectory of SWCNTs. This study can lead to the construction of devices having improved efficiency in the separation of metallic SWCNTs from semiconducting SWCNTs by DEP method.