Flow properties of particle mixtures in micro and nano-channels coated with responsive-polymer brushes

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Responsive polymer brushes are key actors in many biological structures (like glycocalix) and have found application in many technological applications ranging from medicine to nanotechnology (e.g., nanoactuators). In this work we explore the capacity of some of those polymeric structures to control the flow properties of a polydisperse mixture of particles flowing through micro and nanochannels coated with those responsive structures.

Our results shed light on the complexity of those flows and in the case of magnetic controllable structures [1, 2, 3, 4, 5] we observe that it is possible to induce a lateral separation of the different types of particles and in addition to enhance the differences in the velocity of particles due to their different size (see, e.g., Fig. 1). These features lead us to conclude that these kind of systems could be used in the design of new types of chromatographic columns with enhanced properties when compared with current column models.

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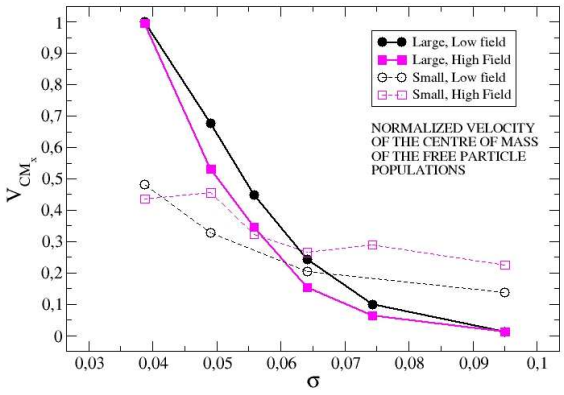

Fig. 1. Normalized velocity of the centre of mass for a bidisperse size distribution mixture of particles (diameter ratio 1:2) as a function of the grafting density of polymers in a magnetic tunable polymeric brush.