Nanocomposites and nanomaterials

Investigation of the repulsive depletion forces and their application in new types of nano- and micro – electromechanical devices

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Taking into account the well known polymer - magnet analogy proposed by de Gennes [1,2] the investigations of the depletion interaction potentials and the depletion forces which arise in dilute polymer solution of real polymer chains with excluded volume interactions (EVI) inserted in a slit between two surfaces were performed. The calculations of the correspondent depletion interaction potentials and the depletion forces were performed in the framework of   the massive field theory approach in fixed space dimensions d=3 up to one –loop order. The recent investigations show, that in the case of presence of dilute polymer solution of real polymer chains with EVI in a slit between two inert surfaces the repulsive depletion forces arise. The appearance of repulsive depletion forces between two inert surfaces leads to reducing of the static friction between these surfaces. This effect of reducing the static friction between surfaces in the case of presence of dilute polymer solution of real polymer chains with EVI has the practical application in new types of nano – and micro – electromechanical devices. Besides, the obtained results indicate about the dependence of the absolute value of the repulsive depletion forces from the shape of the confining surfaces.

1. *de Gennes P. G.*Exponents for the excluded volume problem as derived by the Wilson method// Phys. Lett. A. -1972 .-**38**.-P. 339 -340.
2. *de Gennes P. G.* Scaling Concepts in Polymer Physics (Cornell University Press, Ithaca, NY, 1979).