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Stretching of polymer chain anchored to a surface

Z. Usatenko

Cracow University of Technology, Faculty of Physics, Mathematics and Computer Science, Institute of Physics

24 Warszawska Str., 31-155 Cracow, Poland

z_usat@th.if.uj.edu.pl

The massive field theory approach in a fixed space dimensions d= 3 is extended to investigation of stretching and desorption of an ideal and real polymer chain with excluded volume interactions in a good solvent anchored to repulsive and inert surface. Taking into account the well known correspondence between the field theoretical ϕ^4 O(n)-vector model in the limit $n \to 0$ and the behavior of long-flexible polymer chains the calculations of the average stretching force which arises when the free end of polymer

chain moves away from a repulsive or inert surface are performed up to one-loop order of the massive field theory approach [1]. Besides, the obtained in the framework of the massive field theory approach results are in good qualitative and quantitative agreement with previous theoretical investigations, results of Density Functional Theory (DFT), Monte Carlo (MC) simulations, experimental data obtained with help of the AFM (atomic force spectroscopy) and have important practical applications for understanding of the elastic properties of the individual macromolecules, networks, gels and brush layers.

References

[1] Z. Usatenko, J Stat Mech.: Theor Exp, P09015 (2014).