Abstract Submitted
for the TSF17 Meeting of
The American Physical Society

Decoupling Entropy and Energy in the Partition Function of Grafted Polymers: some Mean-Field Results MARIAN MANCIU, Physics Department, University of Texas at El Paso — The partition function of a polymer can be, in general, written as a sum over shorter configurations (loops, trains and tails), whose probability of occurrence can be easily calculated in the limit of infinite dilution (corresponding to a non-interacting polymer). In the presence of interactions (between monomers and monomers, monomers and solvent and monomers and surfaces), the minimum mean field energy corresponding to a configuration can also be straightforwardly estimated. Consequently, a constrained minimization allows the calculation of the probability of occurrence of the configurations in the polymer brush and therefore the determination of the physical properties of the polymer brush. The model predicts the range in which the well-known Alexander' scaling laws are valid and allows to calculate the transitions from a collapsed brush to a parabolic brush (predicted by the self-consistent field theory of Milner, Witten and Cates) and successively to a step-like brush (suggested by the Alexander-De Gennes model). For two interacting surfaces, it is shown that the adsorbed polymer can induce either long range repulsions or long-range attractions, depending on the interaction parameters.

Marian Manciu
Physics Department, University of Texas at El Paso

Date submitted: 28 Sep 2017 Electronic form version 1.4