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Colloidal assembly on soft substrates JURE DOBNIKAR, TINE CURK, FRANCISCO MARTINEZ VERACOECHEA, DAAN FRENKEL, University of Cambridge, UK — We studied – by Monte Carlo computer simulations - ordering of hard sphere colloidal particles subject to gravity and soft interactions induced by polymer-coated substrates. The polymers are randomly anchored to a flat surface with an average density ranging from very dilute values to a situation where a dense polymer brush with the average height h forms. Studying a single colloid subject to such substrate and the gravity we observed a transition from a regime where it is confined to the hard surface at z=0, via a bimodal regime where it is equally likely to find it at the bottom or at the top, to the regime where it lies on top of the brush at z=h. In a system of many colloids the polymers induce an effective colloid-colloid interaction of entropic origin. We have performed Grand canonical Monte Carlo simulations and explored the structure formation as a function of the anchoring density and the effective gravity of the colloids. Colloids are initially attracted and grow into elongated assemblies with a well-defined lateral width. At low grafting densities such assemblies form percolated networks, while at high enough grafting densities finite clusters are observed. We discuss the relevance of our results to applications like particle sorting, reactions catalysis and passive diffusion.

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