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Universality Classes and Unusual Thermodynamics of Unbinding Transitions of Semi-flexible Polymers Confined to a Surface LEONARDO GOLUBOVIC, Physics Department, West Virginia University, LIANGHUI GAO, Max Planck Institute for Colloids and Surfaces, Potsdam, Germany — We theoretically address unbinding of semi-flexible polymers from long line-like attractive potential wells of various forms. These transition phenomena are seen in recent experiments with DNA adsorbed on microstructured supported cationic lipid membranes, and they provide a new way to stretch single DNA molecules [Hochrein, Leierseder, Golubovic, and Raedler, 2005]. For simple attractive potential wells ("rectangular wells") the transition is of the second order. Heat capacity divergence however has a non-standard from, C$\sim$1/[|Tc - T| log(|Tc - T|)], marked by a logarithmic correction related to the fact that the probability to find the polymer within the well region vanishes as $\sim$1/ log(|Tc-T|) at the transition point. On the other hand, for attractive potential wells having a hard wall potential added on one side, the transition becomes a non-standard hybrid between the first and second order phase transitions: the probability to find the polymer within the well approaches a non-zero value as the transition is approached and then it discontinuously drops to zero (producing a latent heat consumption). However, interestingly, in addition to the latent heat consumption, an unusual heat capacity divergence (of the form C$\sim$1/|Tc - T|$^{1/2}$) also occurs as the polymer unbinding point is approached.

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