Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Quantifying screening ion excesses surrounding stretched, charged polymers JONATHAN LANDY, Materials Dept., UCSB, DUSTIN MCINTOSH, Physics Dept., UCSB, OMAR SALEH, Materials Dept., UCSB — We present the results of a combined theoretical/experimental study in which we have applied thermodynamic identities to infer – from single molecule force-extension curves taken at different salt concentrations – how the number of screening ions associated with a charged polymer changes as a function of its end to end extension. This number, which can change only through non-linear screening mechanisms, turns out to depend non-trivially on both the concentration of salt and the inherent rigidity of the polymer. In the case of a flexible polymer, such as ssDNA, our data indicates that the excess can change substantially between the fully extended and globule states. The effect is reduced for semi-flexible polymers, such as dsDNA, at physiologically-relevant salt concentrations, but it can again become substantial at lower salt concentrations. Based on these findings, we argue that small ion entropic effects should often contribute substantially to free energy differences between the competing conformational states of charged polymers – both *in vivo* and in certain polymer-based materials systems.

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Date submitted: 10 Nov 2011 Electronic form version 1.4