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Flexible polymers under spherical confinement ANGELO CACCIUTO, ERIK LUIJTEN, University of Illinois at Urbana-Champaign — We compute the free energy of confinement ΔF for a flexible self-avoiding polymer inside a spherical cavity. We find two different regimes depending on the degree of compression. For moderate confinement the free energy exhibits a power-law dependence on the diameter D of the cavity. At larger packing fraction ϕ, however, the excluded-volume interactions between monomers dominate and the scaling law breaks down. We demonstrate that in the low density regime $\beta\Delta F$ scales as $(R_G/D)^{3/(3\nu-1)}$, where R_G is the radius of gyration of the unconstrained polymer. This behavior differs from what is observed for confinement inside an infinitely long cylinder or between parallel plates, $\beta\Delta F \sim (R_G/D)^{1/\nu}$. On the basis of our results we revisit the problem of the escape through a hole of a spherically confined polymer and provide a corrected scaling prediction for the average escape time.

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