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On Regularity of Landau-de Gennes Minimizers Around Nearly Touching Spherical Colloids

We study the Landau-de Gennes energy functional,

$$\mathcal{E}_{\xi,\eta}(Q) = \int_\Omega \frac{1}{2}|\nabla Q|^2 + \frac{1}{\xi^2} f(Q) + \frac{1}{\eta^2} g(Q)\, dx,$$

outside two spherical colloids separated by a distance $d > 0$ in the large particle limit while imposing normal boundary conditions and prove $L^\infty(\Omega)$ and Lipschitz estimates for minimizers of this system where the two colloids approach each other in the limit $d \to 0$.