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Polymer Diffusion in Lipid Membranes ASHOK PRASAD, JANE' KONDEV, Physics Department, Brandeis University — Motivated by experiments on fluorescently labeled DNA molecules on a supported lipid bilayer[1], we have examined theoretically diffusion of polymers in two dimensions. The key experimental finding we focus on is the scaling of the diffusion constant of the center of mass, $D \sim 1/N$. This implies that no effective hydrodynamic coupling exists between the diffusing DNA segments in the membrane. We construct our theoretical model using the phenomenological hydrodynamic model of supported membranes proposed by Evans and Sackmann[2]. Our model is based on the pre-averaged Oseen tensor, and is similar to the model of Komura and Seki[3], but elaborated and extended to take explicit account of self-avoidance. We find that the $1/N$ scaling of D can be understood as a consequence of membrane hydrodynamics in the presence of a supporting surface. Further experimental consequences of the model, in particular the diffusion constant for DNA in free standing membranes, will also be discussed. This work was supported by the NSF through grants DMR-9984471 and DMR-0403997. JK is a Cottrell Scholar of Research Corporation.

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