Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

The Anomalous Translocation Dynamics of Long-Chain Molecules SRABANTI CHAUDHURY, BINNY J. CHERAYIL, Dept. of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore 560012, India — Models of translocation based on simple Brownian diffusion mechanisms generally fail to account satisfactorily for anomalies in measured and simulated values of the average time of passage of long chain molecules through narrow pores. In an effort to rationalize these anomalies, we formulate an alternative model in which the time evolution of the number of monomers on one side of the pore is governed by the stochastic dynamics of a particle moving in a linear potential under the action of thermal fluctuations with long-ranged temporal correlations. We use this model in the limits of strong and weak diffusive bias to derive closed form expressions for the mean first passage time for pore crossing and the mean square displacement of a monomeric segment. These expressions, unlike those obtained from fractional Fokker-Planck formulations of the problem, are well-defined everywhere, and are also consistent with available numerical data.

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Date submitted: 16 Nov 2007 Electronic form version 1.4