Entropic transport: Dynamics, Scaling, and Control Mechanisms

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We study nonlinear transport processes through quasi-onedimensional structures, as pores, ion channels and zeolites, exhibiting changes in their shape along the propagation direction. The constrained dynamics of the particles is analyzed by means of the Fick-Jakob equation for the probability distribution which assumes that particles evolves through entropic barriers [1]. Our analysis reveals that entropic transport is distinctly different from that occurring though energy barriers [2]. The current of particles and the diffusion coefficient show a peculiar behavior. Applications to different dynamic situations such as biological transport through ion channels or transport through nanoporous materials are discussed.

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[1] D. Reguera and J.M. Rubi, *Phys. Rev. E* **64**, 061106 (2001).

[2] D. Reguera, G. Schmid, P.S. Burada, J.M. Rubi, P. Reimann and P. Hänggi, *Phys. Rev. Lett.* **96**, 130603 (2006).