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# Anomalously slow transport in single-file diffusion with slow binding kinetics

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We study the effects of binding kinetics on the diffusive transport of particles within narrow channels, which exhibit single-file diffusion (SFD). We computationally study the binding of particles to the channel wall, leading to transient immobility. We find rapid binding kinetics leads to the canonical result that diffusive transport is unchanged by SFD, while slow binding kinetics leads to an anomalously slow diffusive transport. Nevertheless, the relationship between diffusive transport and the subdiffusive motion of tracked particles is maintained in all cases. We exploit this relationship to study transport in the fully-occupied limit, through the diffusion of individual holes. Remarkably, the scaled diffusivity $\hat{D}$ characterizing transport exhibits scaling collapse with respect to the occupation fraction $p$ of sites along the channel. We present a simple physical picture that captures the characteristic occupation fraction $p_{scale}$ and the asymptotic dependence on $p$.

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