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Exact Solutions of Burnt-Bridge Models for Molecular Motor Transport ALEXANDER MOROZOV, EKATERINA PRONINA, ANATOLY KOLOMEISKY, Department of Chemistry, Rice University, MAXIM ARTYOMOV, Department of Chemistry, MIT — Transport of molecular motors, stimulated by interactions with specific links between consecutive binding sites (called "bridges"), is investigated theoretically by analyzing discrete-state stochastic "burnt-bridge" models. When an unbiased diffusing particle crosses the bridge, the link can be destroyed ("burned") with a probability p, creating a biased directed motion for the particle. It is shown that for probability of burning $p = 1$ the system can be mapped into one-dimensional single-particle hopping model along the periodic infinite lattice that allows one to calculate exactly all dynamic properties. For general case of $p < 1$ a new theoretical method is developed, and dynamic properties are computed explicitly. Discrete-time and continuous-time dynamics, periodic and random distribution of bridges and different burning dynamics are analyzed and compared. Theoretical predictions are supported by extensive Monte Carlo computer simulations. Theoretical results are applied for analysis of the experiments on collagenase motor proteins.

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