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RELAXATION HIGH-TEMPERATURE RATCHETS

I. V. Shapochkina,[1-3]* V. M. Rozenbaum,[1,2,4]
S.-Y. Sheu,[5†] D.-Y. Yang,[1‡], S. H. Lin,[1,2] and L. I. Trakhtenberg[6]

[1]*Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei 106, Taiwan*
[2]*Department of Applied Chemistry, National Chiao Tung University, 1001 Ta Hsuen Road, Hsinchu, Taiwan*
[3]*Department of Physics, Belarusian State University, Prospekt Nezavisimosti 4, 220050 Minsk, Belarus*
[4]*Chuiko Institute of Surface Chemistry, National Academy of Sciences of Ukraine, Generala Naumova str. 17, Kiev, 03164, Ukraine*
[5]*Department of Life Sciences and Institute of Genome Sciences, Institute of Biomedical Informatics, National Yang-Ming University, Taipei 112, Taiwan*
[6]*Semenov Institute of Chemical Physics, Russian Academy of Sciences, Kosygin Street 4, Moscow 119991, Russia; State Scientific Center of Russian Federation, Karpov Institute of Physical Chemistry, Moscow, 105064 Russia*

HIGHLIGHTS

- Periodic relaxation processes are included in ratchet operation.
- Jump-like spatial changes of potential profiles are considered.
- Different asymptotics of the ratchet velocity vs the relaxation time are revealed.

ABSTRACT

We consider the overdamped motion of a Brownian particle in an asymmetric spatially periodic potential which fluctuates periodically in time, under assumption of finite duration of the relaxation response of the system on deterministic dichotomous fluctuations. It is assumed that the period of these fluctuations is much larger than the characteristic diffusion time and the potential barrier height is small as compared to the thermal energy (an adiabatic high-temperature flashing ratchet). We derive an analytical expression for the average particle velocity, which is concretized for a saw-tooth potential profile. It is revealed the different, linear and quadratic, asymptotic behavior of the average velocity as a function of the relaxation time for extremely and not extremely asymmetric potential profiles, respectively. The result is interpreted in terms of the self-similar representation.

Keywords: Driven diffusive systems; Brownian motor; Adiabatic flashing ratchet

* shapoch@mail.ru ; † sysheu@ym.edu.tw ; ‡ dyyang@pub.iams.sinica.edu.tw