

## The role of hydrodynamic interaction in the dynamics of active dimer

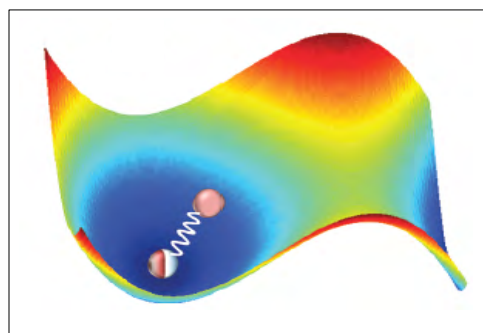
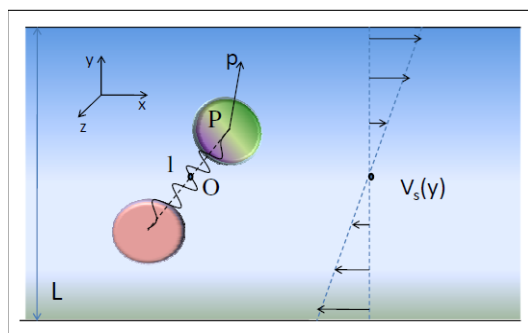
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### Abstract

Janus particle is nano to micro meter sized entity having two distinct faces, only one of which is chemically or physically active. A class of Janus particle is called active or self-propelled Janus which can move extracting energy from environment by creating concentration or thermal gradient at the vicinity of its active surface. As active Janus particle acts as a motor for its self-propelled motion, we model an active Janus particle carrying a cargo (passive particle) to form an active dimer. To use the dimer in different purposes, such as targeted drag (cargo) delivery in medical science, the detailed knowledge about its dynamics in presence of hydrodynamic interaction is necessary. Therefore we study the 3D dynamics of the active dimer suspended in a shear flow. Using numerical simulations, we determine the diffusivity of such dimer in presence of long-range hydrodynamic interactions for different values of its self-propulsion speed and shear flow. We observe that the effect of hydrodynamic interactions is greatly enhanced under the condition that self-propulsion is strong enough to contrast the shear flow. We also numerically investigate the escape kinetics of the active dimer from a meta-stable state. Our simulation results show that the synchronization between barrier crossing events and the rotational relaxation process can enhance the escape rate to a large extent. Moreover, the hydrodynamic interaction conspicuously enhances the escape rate of the Janus-cargo dimer.



### Biography

She is a Ph.D student in Department of Chemistry University of Calcutta, Kolkata, India. She qualified Junior Research Fellowship and Eligibility for Lectureship conducted by Council of Scientific and Industrial Research (CSIR-UGC NET) 2015. Recipient of Young Scientist Award for Oral Presentation in the International Symposium on "Recent Advances in Chemistry and Material Sciences (2019)" organized by the Indian Chemical Society and Chemical Sciences Division, Saha Institute of Nuclear Physics, Kolkata, India, on August 02 & 03, 2019. Her research research interests are on Theoretical Chemistry and Theoretical Physics. Using Non-equilibrium statistical mechanics I wish to explore some challenging problems on Soft-condensed matter, Chemical Physics and Biophysics, mainly on Active matter. Currently, I am pursuing research on self-propelled Janus particles in presence of hydrodynamic interaction and flow field.



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