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Dynamics of Active Particles

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ABSTRACT

Active Janus colloids in which surface reactions provide fast particle motion and directionality represent a new frontier in colloidal science with potential applications in materials science and drug delivery. Janus particles half-coated with a metal such as platinum or gold are promising active particle systems for targeted drug delivery. Most studies of Janus active particles have been performed on planar surfaces. Active particle motion in curved surfaces such as single and double emulsion drops is yet to be explored and could offer a path for the fabrication of active particle clusters. The aim of this research was to design, fabricate and study two active particle systems that will serve as model systems for future studies of active particles in drops. Janus particles half-covered with either platinum or gold were fabricated by first spin-coating diluted suspensions of 1 μm diameter polystyrene particles on a silicon wafer followed by sputtering and re-dispersion in water. The platinum Janus particles react with hydrogen peroxide while the gold Janus particles reacts to monochrome light in a mixture of water and 2,4-lutedine. As a preliminary test, the motion of the Janus particles was optically observed in flat capillaries as a function of hydrogen peroxide concentration or light intensity. ImageJ was used to find the particle location as a function of time to calculate their mean square displacement and compare it with stablished active particle motion models. This work serves as the foundation for future work on the development of active particle clusters for drug delivery applications.

Keywords,

Janus Particles , Active Particles , half coated