

## **Non-Equilibrium Thermodynamics of Catalytic Nanomotors and Micropumps**

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The conversion of chemical energy into directed motion is a key point behind the high efficient operation of biomolecular machines. Inspired by nature, there is a growing interest in engineering novel artificial machines which can self-propel and carry out autonomous work “a la carte,” mimicking the impressive molecular machinery of living organisms. In this context, Janus particles, bimetallic nanomotors and micropumps, which are powered by catalytic reactions at two different metals, stand out as one of the most promising candidates. But how catalytic reactions end up driving particle or fluid motion is a rather complex non-equilibrium process involving the coupling of electrochemical reactions, electrostatics, mass and charge transport, and fluid dynamics. In this context, a theoretical description complemented by numerical simulations becomes a powerful tool to optimize and shed light on the complex chemo-mechanical actuation of catalytic objects. In this talk, we will discuss the non-equilibrium thermodynamics concepts controlling the operation of catalytic micropumps. The results of this study facilitate a better understanding of the whole scenario behind this process and also provide important clues on how to design more efficient catalytic micro/nano motors for future applications.