Why Nature Chose Catalysis

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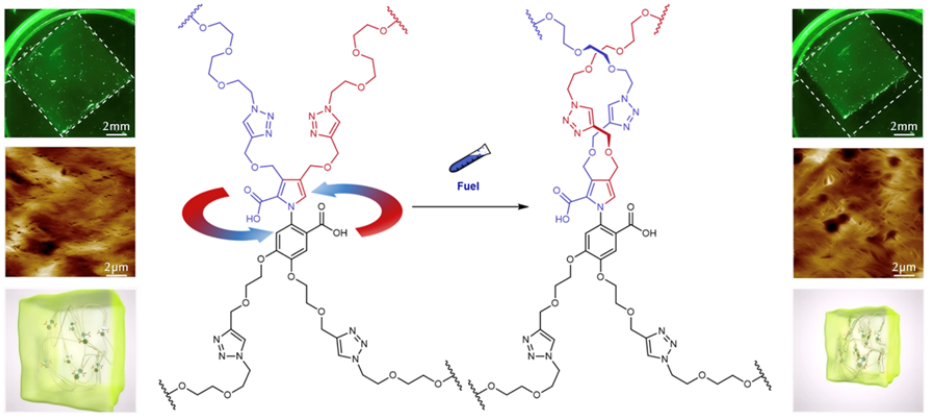
It seems counter-intuitive that the act of catalysis—simply the acceleration of a chemical reaction—somehow enables work to be done by the catalyst through the transduction of chemical energy from the reaction it accelerates. Yet this is how all of biology is powered.[1,2] Biomolecular motors transduce energy from the reaction they catalyse—generally ATP to ADP—to power the diverse array of tasks required by the cell.[3]

We shall discuss the transduction of chemical energy by a synthetic catalyst to generate force and perform mechanical work.[4] The simplicity of the molecular catalyst reveals the fundamental principles behind how the process occurs. The findings add to the understanding of how biology is powered by chemical energy and provide a blueprint for how to design artificial catalysis-driven molecular nanotechnology.[5] The experimental demonstration of the transduction of chemical energy to perform work against a load provides a minimalist mechanistic illustration of how catalysis-driven molecular motors extract order from chaos.[2]



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