

# Directional and Autonomous Non-Equilibrium Operation of a Multiresponsive Molecular Shuttle

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Nanoscale devices activated by light as a clean and highly controllable energy source can enable ground-breaking applications in technology and medicine.<sup>1</sup> Artificial molecular machines that exploit light energy autonomously to generate continuous motion are particularly appealing, especially for energy conversion purposes.<sup>2</sup> However, advances in the construction of such molecular architectures are highly challenging and only a limited number of systems have been reported to date.<sup>3</sup>

In light of this, we developed a [2]rotaxane composed of a crown ether macrocycle threaded by an axle embedding pH-sensitive and photoactive recognitions sites. In this system, the mechanical interlocking of the molecular components enables reversible and continuous ring shuttling between the extremities of the axle as a result of the entanglement of photoinduced isomerization and proton transfer processes.<sup>4</sup>

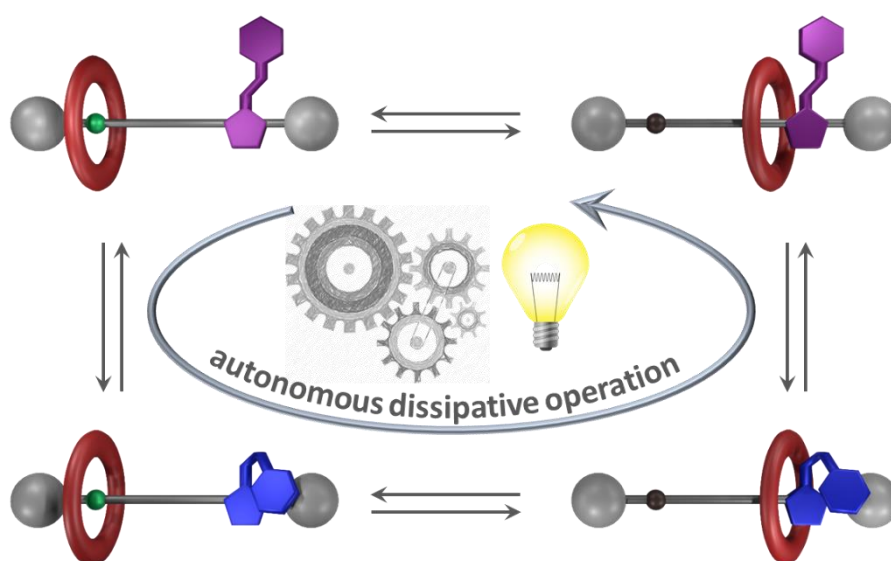


Figure 1. Closed network of reactions connecting the four states of the [2]rotaxane system.

## References:

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