Photo- and redox- active artificial molecular machines and motors

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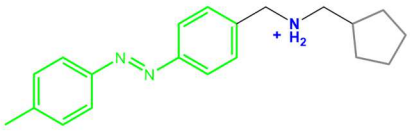
Molecular machines and motors are a type of molecular device whose operation involves the controlled mechanical motion of their components against random thermal agitation supported by an energy source. The way in which energy is administered to an artificial molecular machine is a crucial issue: electrical and optical stimuli are a valuble option, as they are readily turned on and off and can be applied locally with high resolution. They both offer powerful analytical tools to characterize molecular-scale systems from the thermodynamic and kinetic points of view. Moreover, by exploiting electrochemically and photochemically induced processes, one can "write" (i.e., cause changes) and "read" (i.e., monitor) chemical systems with control in time and space.

We will describe here some recent investigations undertaken in our laboratory on photo- and electroactive molecular devices, based on two classes of molecules, which are endowed with peculiar features for the design of directionally controlled motors.

1. Mechanicaly interlocked molecules based on the ammonium-crown ether recognition motif are operated by exploiting *E-Z* photoisomerization of an azobenzene photochromic unit integrated in the molecular components, which controls the thermodynamics and kinetics of the molecular motions.
2. Functionalized calix[6]arenes are hosts for bipyridinium based guests, whose affinity can be electrochemically tuned. The heteroditopic, three dimensional, non symmetric macrocycle provides further tools for the control of the direction of motions of the molecular components.

Module for photoactive molecular machines



Tris(phenylureido)calix[6]arene: a host for electroactive molecular machines