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EXTENDED EDITION

## Calixarene-based rotaxane architectures: developments and perspectives

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SERENA SILVI is a researcher at the Chemistry Department "Giacomo Ciamician". She received her Laurea in Chemistry cum laude from the University of Bologna in 2002, under the supervision of prof. Vincenzo Balzani, and her Ph.D. in 2006 with a thesis entitled "Artificial Molecular Machines". She authored or co-authored more than 70 publications on international journals, several book chapters, a European patent, and she edited volumes on photochemistry and molecular machines. She works on the photophysical, photochemical and electrochemical investigation of supramolecular systems. In particular her research is focussed on the design and characterization of artificial molecular machines and complex systems for signal processing.

The control on the direction of motion in artificial molecular machines is a challenging task and a fundamental requirement to construct functioning devices. In order to design linear motors based on rotaxane architectures a key requisite is the asymmetry of the molecular components. In this regard, calixarenes are appealing macrocycles for the implementation of rotaxane-based molecular motors, as they have two different rims, which in principle can be crossed by an axle molecule in two controllable directions. We have investigated functionalized calix[6]arenes which can host 4,4'-bipyridinium-based molecular axles.<sup>1</sup> In particular we have demonstrated that, in proper conditions: (i) the calixarene can be crossed by a bipyridinium axle in a controlled direction<sup>2</sup> and (ii) non-symmetric axles can enter into the calixarene wheel with a preferential extremity, and, therefore, the wheel is capable of intra- and intermolecular self-sorting.<sup>3</sup> More recently we have demonstrated that the calixarene scaffold is capable to accelerate the alkylation reaction of a pyridinium-based guest inside its cavity. Moreover, we proved that with this supramolecularly-assisted reaction it is possible to achieve a full orientational selectivity in the formed oriented rotaxanes.

### References

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