Calix[n]arenes in Nano-Biosystems

Host Professor Pr. B.J. KIM
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Context Calix[n]arenes are one of the most widely studied organic host classes. These bucket shaped molecules have gained tremendous importance for having interactions with biological molecules. And indeed their molecular recognition ability has been widely used for various applications such as diagnosis or medicine. Beside metallic nanoparticles are quite popular because of their unique optical and electronical properties. Their combination with calix[n]arenes is promising for bio-sensing and for their potent biomedical applications.

Objective The assembly of hybrid metallic nanoparticles will be investigated over a wide range of biomolecules (DNA, protein, surfactant). Moreover devices fabricated from micro and nanotechnologies will be used to understand the mechanism of these supramolecular systems at nano scale.

Method Recently we have developed very stable silver nanoparticles capped with different calix[n]arenes (fig. 1). Their complexation with biomolecules has been studied by conventional physico chemical analysis (Spectrophotometry, Fluorimetry, NMR, etc.) and by Silicon Nano Tweezer.

Results Calix[n]arenes nanoparticles have been shown to possess antiviral activities [1] or to be used as biosensor [2]. In the case of cytosine a possible mechanism at the molecular level can be derived from the solid-state structure of the cytosine: para-sulphonatocalix[4]arene complex (fig. 2). Their mechanical effect on DNA strand has been recently investigated with Silicon Nano Tweezer. This is a great interest for elucidating their biochemistry on DNA [3]. This work is done in collaboration with the University of Lyon 1, LMI-UMR 5615

Fig. 1. Schematic representation of the organization of para-sulphonatocalix[4]arene on silver nanoparticles

Fig. 2. Schematic representation of the aggregation mechanism induced by 4 cytosines bridging the calix[n]arene silver nanoparticles (in grey).

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References