Institute of Biomaterials and Bioengineering

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Threading Cyclodextrins onto Polymer Chains

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Cyclodextrin (CD) polyrotaxanes are molecular entities in which many CD rings are threaded onto a polymer chain. I shall describe two basic design principles for the synthesis of polyrotaxanes, namely the threading and the polymerization approach. Furthermore, I shall speak about possible applications in both life science and material technology.

Cationic polyrotaxanes were assembled in aqueous solution by subsequent threading a heptacationic CD onto amphiphilic ionenes at elevated temperatures. They are especially suited for gene transfection into various cells because they form uniform nanoparticles with DNA and RNA. These nanoparticles are taken up by human cancer cells as well as healthy cells as observed by confocal fluorescence microscopy. Our polyrotaxanes show very high transfection rates comparable or even superior to polyethylene imine (PEI) which is most often applied up to now.

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