Séminaire LIONS

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Structural role of the counterions in peptide nanotube self-assembly

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We offer a detailed description of the role of electrostatics in a self-assembling system that simply consists of an octapeptide salt solubilized in pure water. This salt, lanreotide-acetate, is known to self-assemble into dimers and, above a critical concentration, into nanotubes. Free from any screening buffer, we can observe by osmolarity and pH measurements the interactions between the species in solutions and their counterions, above and below the critical assembly concentration. Our results provide explanations for the selection of the dimer as the nanotube building block. Moreover, we tackle a very subtle feedback between the surface chemistry of the nanotubes and electrokinetics effects in the solution surrounding them. Secondly, by small angle x-ray scattering, we observe a control of nanotube diameter through counterions exchange, which implies a structural role of the counterions. This observation is refined by a model that shed light on the respective importance of the different sites. Finally, the differential effects on the solubility of the peptide and on the morphology of the self-assembly of the charged sites is assessed by chemical deletion of one or the other charge by acetylation.

Références:
[1] “Self association process of peptide filaments into embedded nanotubes via large monodispersed nanotubes” C. Valéry et al., *Proc. Natl. Acad. Sci. USA* 100 (18) 10258-10262 (2003)
[2] “Elucidation of the self-assembly pathway of lanreotide octapeptide into beta-sheet nanotubes: role of two stable intermediates” E. Pouget et al., *J. Am. Chem. Soc.* 132 (12) 4230–4241 (2010)