Centro Singular de Investigación en Química Biolóxica e Materiais Moleculares

Conferencia:

Adaptive compartments with life-like behavior

Jan van Hest

Technische Universiteit Eindhoven – The Netherlands

25/04/18

... ...

Aula de Seminarios do CIQUS

12:15 h

Más información:
www.usc.es/ciqus

XUNTA DE GALICIA
CONSELLERÍA DE CULTURA, EDUCACIÓN E ORDENACIÓN UNIVERSITARIA

UNIVERSIDADE DE SANTIAGO DE COMPOSTELA

CAMPUS VIDA
CAMPUS DE EXCELENCIA INTERNACIONAL

Jan van Hest obtained his PhD from Eindhoven University of Technology in 1996 in macro-organic chemistry with prof E.W. Meijer. He worked as a postdoc with prof D.A. Tirrell on protein engineering. In 1997 he joined the chemical company DSM in the Netherlands. In 2000 he was appointed full professor in Bio-organic chemistry at Radboud University Nijmegen. As of September 2016 he holds the chair of Bio-organic Chemistry at Eindhoven University of Technology. The group's focus is to develop well-defined compartments for nanomedicine and artificial cell research. Using a combination of techniques from polymer science to protein engineering, well-defined carriers and scaffolds are developed for application in e.g. cancer treatment, immunology and ophthalmology.

Van Hest was elected member of the "Jonge Akademie", (The Young Academy of the Royal Netherlands Academy of Arts and Sciences) in 2005. He has won a TOP grant (2007) and a VICI grant (2010), the highest personal career grant obtainable through open competition in the Netherlands. In 2012 he was one of the main applicants of the 10-year gravitation program on functional molecular systems (26.9 M€, with the universities of Eindhoven, Groningen and Nijmegen). In 2016 he was awarded an ERC Advanced grant, and currently also coordinates the Horizon 2020 ITN Network Nanomed, dedicated to developing smart delivery carriers in medicine. Van Hest is associate editor of Bioconjugate Chemistry. He is furthermore an advisory board member of Macromolecular Bioscience, Biomacromolecules, Journal of Materials Chemistry, Chemical Science and ACS Central Science. He has been elected Fellow of the Royal Society of Chemistry of the UK.

37 PhD students have obtained their doctorate degree under his supervision, and he currently supervises 20 PhD students. He has published around 350 papers (H factor 58). He is also cofounder of four start-up companies (Encapson, FutureChemistry, Noviosense and Noviotech).

Link: https://www.tue.nl/universiteit/faculteiten/scheikundige-technologie/onderzoek/onderzoeksgroepen/molecular-systems-and-materials-chemistry/bio-organic-chemistry/

Adaptive compartments with life-like behavior

Compartmentalization is generally regarded as one of the key prerequisites for life. In living cells, not only the cell itself is a compartment, with its properties controlled by the semipermeable cell membrane, but also the organelles play a crucial role in protecting and controlling biological processes. To better understand the role of compartmentalization, there is clear need for model systems that can be adapted in a highly controlled fashion, and in which life-like properties can be installed. Polymer-based compartments are robust and chemically versatile, and as such are a useful platform for the development of life-like compartments. In this lecture both an artificial organelle and cell system will be discussed. The artificial organelles are composed of biodegradable amphiphilic block copolymers that self-assemble into vesicular structures. These so-called polymersomes are loaded with enzymes and are semi-permeable for small molecule substrates. Upon introduction in living cells, they affect metabolic pathways as artificial organelles. A different type of polymersome is created via a shape change process in which a bowl-shaped structure is obtained. Within the cavity of the bowl enzymes are loaded which provide the nanostructure with motility upon conversion of chemical energy into kinetic energy.

The synthetic cell platform is composed of a complex polymer coacervate, stabilized by a biodegradable block copolymer. The specific feature of the polymer membrane is its semipermeable character. Enzymes inside the protocell can therefore still be reached by their substrates, and small molecule products can be excreted. This allows protocell communication with this robust synthetic platform.