

# Biomimetic protein bioconjugates for biomaterials and artificial organelles design

**Prof. Dr. Sébastien Lecommandoux**

University of Bordeaux, France

**BioMACROMOLECULES**

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## Editor-in-Chief



**Sébastien Lecommandoux**  
Professor, Bordeaux-INP, ENSCBP  
Director, Laboratoire de Chimie des Polymères Organiques (LCPO)  
  
Bordeaux Polytechnic Institute  
Université de Bordeaux  
UMR CNRS 5629  
16 Avenue Pey Berland, 33607 PESSAC cedex,  
FRANCE  
Phone: +33 5 56 84 66 03  
E-mail: [eic@biomac.acs.org](mailto:eic@biomac.acs.org)

## Summary:

We report here an overview on the design of Elastin Like Polypeptides (ELPs) based conjugates and their applications in nanomedicine, biomaterials and artificial cells. We pay special attention to their modification with saccharides [1], polysaccharides [2] and lipids [3], aiming at mimicking both the structure and functionality of glycoproteins and lipoproteins. We developed synthetic strategies for the design of glycosylated polypeptides and polysaccharide-polypeptide biohybrids with controlled placement of sugar functionality. The ability of these systems for different biomedical applications, from drug-delivery to inhibitor, will be presented [4]. In addition, the design of a new class of lipoproteins based on ELPs with unique thermo-responsive character will be proposed. These biosynthetic lipoproteins can self-assemble into lipopolymersomes, with tunable membrane permeability, opening avenues in drug delivery and artificial cell design [3]. Finally, our most recent advances in the design of complex, compartmentalized and functional artificial cells will be presented. Such a system is a first step towards the challenge of structural cell mimicry and functionality, and could act in the future as an autonomous artificial cell capable of detecting and healing in situ any biological deregulation [5-7].

以下の予定でオンラインセミナーを開催します。  
参加ご希望の方は、7/21正午までに事前登録をお願いします。

日時： 2023年7月24日 (月) 14時  
(13:45より開場致します)

演者： Prof. Dr. S. Lecommandoux  
フランス・ボルドー大学 教授  
Biomacromolecules / ACS  
Chief Editor

言語： 英語

事前登録サイト：

<https://forms.gle/ZJwQ6Ny3Kyfu5agc9>

**[1] Design of Thermoresponsive Elastin-Like Glycopolypeptides for Selective Lectin Binding and Sorting**

LM. Bravo Anaya et al. *Biomacromolecules* 22, 76-85 (2021).

<https://doi.org/10.1021/acs.biomac.0c00374>

**[2] Aqueous synthesis and self-assembly of bioactive and thermo-responsive HA-b-ELP bioconjugates**

M. Levêque et al. *Biomaterials Science* 10, 6365-6376 (2022).

<https://doi.org/10.1039/D2BM01149B>

**[3] Thermosensitive Vesicles from Chemically Encoded Lipid-Grafted Elastin-like Polypeptides**

V Ibrahimova et al. *Angew. Chem. Int. Ed.* 60, 15036-15040 (2021).

<https://doi.org/10.1002/anie.202102807>

**[4] Hyaluronic-Acid-Presenting Self-Assembled Nanoparticles Transform a Hyaluronidase HYAL1 Substrate into an Efficient and Selective Inhibitor**

H. Duan et al. *Angew. Chem. Int. Ed.* 59, 13591-13596 (2020).

<https://doi.org/10.1002/anie.202005212>

**[5] Dynamic Spatial Formation and Distribution of Intrinsically Disordered Protein Droplets in Macromolecularly Crowded Protocells**

H. Zhao et al. *Angew. Chem. Int. Ed.* 59, 11028-11036 (2020).

<https://doi.org/10.1002/anie.202001868>

**[6] Spatiotemporal Dynamic Assembly/Disassembly of Organelle-Mimics Based on Intrinsically Disordered Protein-Polymer Conjugates**

H. Zhao et al. *Advanced Science* 2102508 (2021).

<https://doi.org/10.1002/advs.202102508>

**[7] Control of Enzyme Reactivity in Response to Osmotic Pressure Modulation Mimicking Dynamic Assembly of Intracellular Organelles**

C. Schwartzman et al. *Advanced Materials* 202301856 (2023).

<https://doi.org/10.1002/adma.202301856>

Sébastien Lecommandoux received his Ph.D. (1996) in Physical Chemistry from the University of Bordeaux. After a postdoctoral experience at the University of Illinois (UIUC, USA) in the group of Prof. Samuel I. Stupp, he started his academic career at the Laboratoire de Chimie des Polymères Organiques as Associate Professor in 1998 and was promoted to Full Professor at Bordeaux INP in 2005. He is currently Director of the Laboratoire de Chimie des Polymères Organiques (LCPO-CNRS) and is leading the group “Polymers Self-Assembly and Life Sciences”. His research interests include the design of bio-inspired polymers for biomaterials and pharmaceutical development, especially based on polypeptide, proteins and polysaccharide-based block copolymers self-assembly, the design of polymersomes for drug-delivery and theranostic, as well as biomimetic approaches toward design of synthetic viruses and artificial cells. He published over 200 publications in international journal, 6 book chapters and 12 patents (2 being licenced), with over 17000 citations (h-factor 65, Google Scholar). He is also co-director of the joint laboratory LCPO-L'OREAL and co-founder of Emissary Cosmetics. Sébastien Lecommandoux is recipient of the CNRS bronze medal (2004), Institut Universitaire de France Junior Chair (IUF 2007), Fellow of the Royal Society of Chemistry RSC (2017), Seqens Award of the French Academy of Science (2019), Member of the Academia Europaea (2020), XingDa Lectureship Award from Peking University (2021). He has been Editor-in-Chief of Biomacromolecules (ACS) since 2020 after serving as Associate Editor since 2013. He is also in the Editorial Advisory Board of several international journals, including Bioconjugate Chemistry (ACS), Polymer Chemistry (RSC) and Biomaterials Science (RSC).