

Materials Chemistry Seminar

Friday, November 3, 2023
11:30 a.m. ~ BRWN 4102

"Dendrimers: Biomedical Applications and Adhesion"



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Abstract:

Dendrimers are hyperbranched macromolecules with a globular shape. They are monodisperse, have internal cavities, and possess numerous terminal groups on their periphery, making them easily functionalizable. As a result of these interesting features, they have been implemented in biomedical applications, sensors, catalysis, etc. Although, due to a step-by-step synthesis, dendrimer synthesis remains tedious and expensive, limiting their implementation. [1]

To overcome this limitation, new dendritic macromolecules have been developed, such as dendronized hyperbranched polymers and dendrimer-polymer hybrids. Such macromolecules combine appealing characteristics of linear polymers and dendrimers. These polymers have already proven their interest in biomedical applications, such as drug delivery and gene therapy.[2]

We are currently exploring the use of dendrimer-polymer hybrids to be used in adhesion. We functionalized the commercially and FDA-approved Pluronic F-127 with polyester dendritic structures on both ends following previously published results.[3] Subsequently, we appended catechol moieties onto this hybrid macromolecule to confer it with adhesive properties, and we tested its adhesion on aluminium substrates. We are also studying the ability of these materials to form hydrogels with thermo-responsive behaviour.

Biosketch: Alexandre Lancelot received his PhD in Organic Chemistry, entitled "new dendritic derivatives for applications in nanomedicine: drug delivery and gene transfection" at the University of Zaragoza (Spain) in 2017. Since 2020, he has been employed as a postdoctoral research scholar at Purdue University. In 2022, he was granted a Marie Skłodowska-Curie Action fellowship to develop new hydrogels for skin closure and local drug delivery applications. Throughout his postdoctoral experiences, he has acquired expertise in polymer chemistry for biomedical applications and adhesives & coatings, as well as biomimetic and bio-sourced polymers. To date, his research work has been gathered in 11 articles, 2 review papers and 1 patent.

[1] F. Najafi, M. Salami-Kalajahi, H. Roghani-Mamaqani, J. Iran. Chem. Soc. 2021, 18, 503–517. DOI: 10.1007/s13738-020-02053-3.

[2] E. Martí Coma-Cros, A. Lancelot, M. San Anselmo, L. Neves Borghetti-Cardoso, J.J. Valle-Delgado, J.L. Serrano, X. Fernández-Busquets, T. Sierra, Biomater. Sci., 2019,7, 1661-1674. DOI: 10.1039/C8BM01600C.

[3] I. Jiménez-Pardo, R. González-Pastor, A. Lancelot, R. Claveria-Gimeno, A. Velázquez-Campoy, O. Abian, M.B. Ros, T. Sierra, Macromol. Biosci. 2015, 15, 1381 – 1391. DOI: 10.1002/mabi.201500094.