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CiQUS Lecture

Directed cell behaviour through engineering of complex mechanics in supramolecular biomaterials

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Abstract

The natural extracellular matrix (ECM) provides a myriad of biophysical and biochemical cues to cells to instruct their behaviour throughout life. While stiffness is widely recognized for impacting fundamental cellular processes ranging from spreading to differentiation, there is a growing appreciation of other mechanical properties that are either time- or strain-dependent such as viscoelasticity, plasticity, or strain stiffening. Dynamic hydrogels consisting of non-covalent or dynamic covalent bonds exhibit these complex properties which are essential to develop synthetic 3D culture substrates that more accurately represent the in vivo condition. In my talk, I will share our efforts in developing supramolecular polymer materials whose mechanics can be controlled in a user-defined manner to direct processes such as cell migration and biopolymer synthesis. I will show that the mechanics of these materials can be modulated in space and time with light in different forms to influence the behavior of several cell types commonly used to model development and disease in vitro.

Biosketch

Roxanne Kieltyka received her BSc in Materials Chemistry from the University of Toronto (Toronto, Canada) in 2003. She then joined the group of Hanadi Sleiman at McGill University (Montreal, Canada) to work on the development of novel platinum-based complexes for the targeting of G-quadruplexes as an anti-cancer strategy. After receiving her PhD in 2009, she became a postdoctoral researcher in the group of E. W. Meijer at the Eindhoven University of

Technology (Eindhoven, the Netherlands) in the area of supramolecular materials. Roxanne joined the Supramolecular and Biomaterials Chemistry group at Leiden University (Leiden, the Netherlands) in 2003 where she is now an associate professor. In 2018, she was named one of the Talented 12 by Chemical and Engineering News (C&EN) and received an ERC Starting Grant in 2019. Her research focuses on the development of supramolecular biomaterials, ranging from studying their self-assembly to engineering applications in the healthcare area.