UC San Diego
JACOBS SCHOOL OF ENGINEERING
NanoEngineering

UCSD NanoEngineering/Chemical Engineering

SPECIAL SEMINAR

Monday, October 7, 2019
Seminar Presentation: 11:00am – 12:00pm
SME room 347

"Tailor-made nanoparticles from molecular polymer brushes"

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Abstract: An application-focused design of materials is expected to overcome many limitations in current materials and biomedical sciences. The possibility to precisely engineer at the nanoscale enables the synthesis of materials with tailored chemical composition and physicochemical properties. Advances in synthetic polymer science have further nourished the fabrication of complex and functional polymer nanomaterials. Within this space, molecular polymer brushes (MPBs) form a unique class of materials that are extremely powerful in molecular templating,[1] self-assembly,[2] and nanomedicine.[3]
Molecular brushes are one-dimensional nanostructures consisting of polymer chains densely tethered onto a polymer backbone. The grafting density of polymer chains eventually becomes so high that the chains become crowded and stretched, leading to their typical architecture. Due to the shape-persistent nature, the spatial dimensions and the tunable structure, molecular brushes offer new opportunities in nanomaterials synthesis using bottom-up fabrication and provide access to nanostructures that are difficult to yield from linear copolymers or otherwise. Exploiting their cylindrical shape and multiple individually separated compartments and functionalities, these materials and their analogues may be applied as building blocks in nanoscience and engineering.[4]
In our current research, we have continued to develop MPBs as templating scaffolds focusing on achieving one-dimensional and topographically structured soft nanomaterials,[5] with the long-term goal to mimic the structure (and function) of bioactives. Similarly, we are investigating their scope in nanomedical applications.[6-8]

References

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5. T. Pelras, C.S. Mahon, Nonappa, O. Ikkala, A.H. Gröschel, M. Müllner *J. Am. Chem. Soc.* 2018, *140*, 12736.
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Biosketch: Markus received his Diplom in polymer and colloid chemistry at the University of Bayreuth, Germany. After research visits to the University of Lund, Sweden, and The University of Melbourne, Australia, he received his PhD in polymer chemistry under the supervision of Prof. Axel H.E. Müller in 2012. He subsequently re-joined the University of Melbourne as a postdoctoral researcher, mentored by Prof. Frank Caruso. In 2013, he was awarded a McKenzie Postdoctoral Fellowship by the University of Melbourne. Markus initiated the Polymer Nanostructures Group within the Key Centre for Polymers and Colloids after joining the School of Chemistry at the University of Sydney in 2015. He is currently a Senior Lecturer, an ARC DECRA Fellow (2018-2020) and a chief investigator in the University of Sydney Nano Institute (Sydney Nano). He further serves as part of the Advisory Board for *Polymer Chemistry* and *Materials Horizons* and the Chair of the RACI NSW Polymer group. His core expertise is in the synthesis of complex polymers, with the aim to study polymer nanomaterials in the biological domain, to apply them in the fabrication of structured hybrid materials, and to steer the self-assembly of polymers into well-defined soft matter.