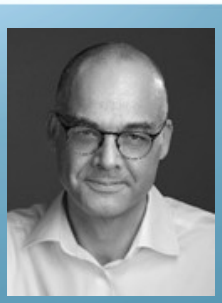
NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

MSE-Colloquium@NTU

24 November 2022, 10:00 am
Lecture Theatre 4 (NS4-02-34)



Mechanochemistry of Solvent-Swollen Surface-Grafted Polymer Brushes, and Polymer Networks

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Abstract

Mechanical forces have been known for a long time to facilitate bond cleavage reactions in polymer materials. Typically, the impact of force on the stability and reactivity of polymers is investigated by subjecting polymers to relatively high mechanical forces such as those that are the result of ultrasonication, high shear flow fields, or that are exerted on polymers during tensile testing or mastication processes. Much less investigated, in contrast, are the effects of much weaker forces, such as those that are generated by solvent swelling of crosslinked networks, on the stability of polymers. This talk will highlight recent work from our laboratory that indicates that solvent-swelling of surface-grafted polymer brush films, or of covalently crosslinked polymer networks, mechanochemically accelerates chemical reactions, which can lead to bond cleavage at polymer brush interfaces, or trigger polymer network degradation.

Biography

Harm-Anton Klok is Full Professor at the Institutes of Materials, and Chemical Sciences and Engineering at the Ecole Polytechnique Fédérale de Lausanne (EPFL) (Lausanne, Switzerland). He studied chemical technology at the University of Twente (Enschede, The Netherlands) from 1989 to 1993 and received his Ph.D. in 1997 from the University of Ulm (Germany) after working with Martin Möller. After postdoctoral research with David N. Reinhoudt (University of Twente) and Samuel I. Stupp (University of Illinois at Urbana–Champaign, USA), he joined the Max Planck Institute for Polymer Research (Mainz, Germany) in early 1999 as a project leader in the group of Klaus Müllen. In November 2002, he was appointed to the faculty of EPFL. Since 2012 he is Director of the Institute of Materials and the Molecular and Hybrid Materials Characterization Center at EPFL.

His research interests include polymer surface and interface science, polymer nanomedicine and polymer synthesis and functionalization.

Harm-Anton Klok is recipient of various awards including Arthur K. Doolittle Award of the American Chemical Society (2007), Distinguished Scientist Award by the Chinese Academy of Sciences President's International Fellowship Initiative (2020), etc. He has been Associate Editor of the American Chemical Society journal Biomacromolecules (2007 - 2021), and is currently Associate Editor of the American Chemical Society journal ACS Polymers Au. He also serves or has served on the editorial advisory board of Eur. Polym. J., J. Polym. Sci. A: Polym. Chem., Macromolecules, ACS Macro Letters, Macromol. Rapid Commun., Macromol. Bioscience, and ACS Applied Bio Materials.

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