Colloquium

Making and Unmaking Vinyl Polymers via Radical Polymerizations

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Controlled radical polymerization (CRP) is widely used to prepare a broad range of polymeric materials for diverseapplications in various fields [1,2]. One of the most important properties of CRP polymers is the ability to maintainhigh livingness throughout the polymerization. In the first part of the talk, an acid-triggered radical polymerizationwill be demonstrated which leads to the next generation of complex multiblock copolymers with controlled sequence,dispersity, and end-group fidelity [3,4]. Although high end-group fidelity is crucial to facilitate the synthesis of well-defined block copolymers, it has rarely been exploited to reverse controlled radical polymerization and regeneratethe starting materials. In the second part of the talk, I will first show how, under thermodynamically favoured conditions[5,6], it is possible to depolymerize linear, bulky, cross-linked, and functional polymethacrylates made by reversibleadditionfragmentation chain-transfer (RAFT) polymerization [7]. Notably, the depolymerization product can beutilized to either reconstruct the linear polymer or create an entirely new insoluble gel that can also be subjectedto depolymerization. A solvent-free chemical recycling methodology that efficiently operates for both ATRP andRAFT-synthesized materials will also be presented [8]. However, both depolymerization reactions are uncontrolledin nature (i.e., rapid monomerization of activated chains), thus providing no handle over the molecular weight andlimiting further applications. To address this, a controlled depolymerization strategy is developed that enables alinear decrease in molecular weight over time [9]. Such gradual unzipping of polymer chains is not only useful forrecycling purposes but also enables the structural characterization of various copolymers (i.e., AB diblock vs. BAdiblock vs statistical vs gradient) by facilitating the sequential release of monomers from the chain-end. At the end,I will discuss how we can potentially utilize the obtained knowledge to switch from designer polymers to commerciallyavailable materials containing undisclosed impurities.Athina AnastasakiDepartment of Materials, ETH Zrichpolymeric.mat.ethz.chMaking and UnmakingVinyl Polymers viaRadical PolymerizationsJune27 Thursday 2024 15:30Moonstone Room F[1] K. Parkatzidis, H. S. Wang, N. P. Truong, A. Anastasaki, Chem 2020, 6, 15751588.[2] N. P. Truong, G. R. Jones, K. G. E. Bradford, D. Konkolewicz, A. Anastasaki, Nat. Rev. Chem. 2021, 5, 859869.[3] M.-N. Antonopoulou, R. Whitfield, N. P. Truong, D. Wyers, S. Harrisson, T. Junkers, A. Anastasaki, Nat. Chem. 2022, 14, 304312.[4] M.-N. Antonopoulou, G. R. Jones, A. A. Kroeger, Z. Pei, M. L. Coote, N. P. Truong, A. Anastasaki, Nat. Synth. 2024, 3, 347356.[5] G. R. Jones, H. S. Wang, K. Parkatzidis, R. Whitfield, N. P. Truong, A. Anastasaki, J. Am. Chem.

Soc. 2023, 145, 98989915.[6] V. Lohmann, G. R. Jones, N. P. Truong, A. Anastasaki Chem. Sci. 2024, 15, 832853.[7] H. S. Wang, N. P. Truong, Z. Pei, M. L. Coote, A. Anastasaki, J. Am. Chem. Soc. 2022, 144, 46784684.[8] R. Whitfield, G. R. Jones, N. P. Truong, L. E. Manring, A. Anastasaki, Angew. Chem. Int. Ed. 2023, 62, e202309116.[9] H. S. Wang, K. Parkatzidis, T. Junkers, N. P. Truong, A. Anastasaki, Chem 2024, 10, 388401.

Thursday, June 27, 2024 11:30am - 12:30pm

Moonstone Bldg / Ground floor / Seminar Room F (I24.EG.030f)

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