

Separation of Polyacrylate Living Chains Prepared via ATRP with Poisson-like Molecular Weight Distribution

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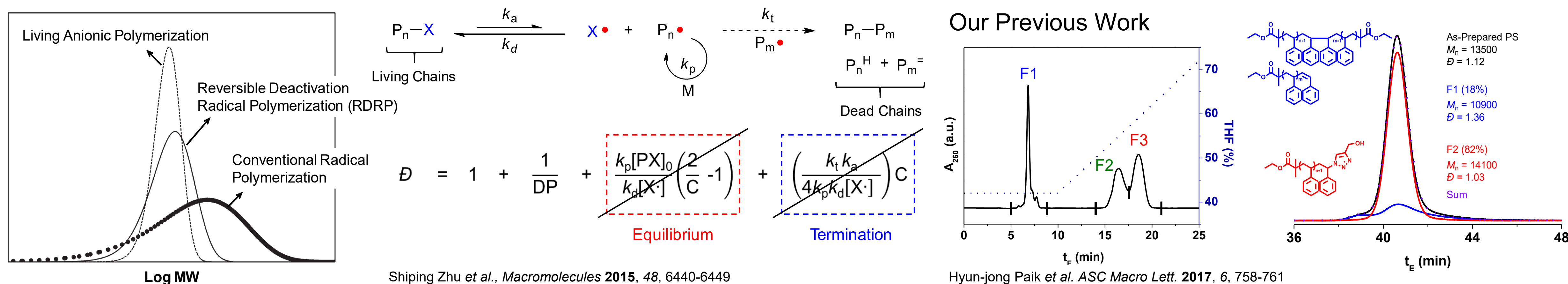
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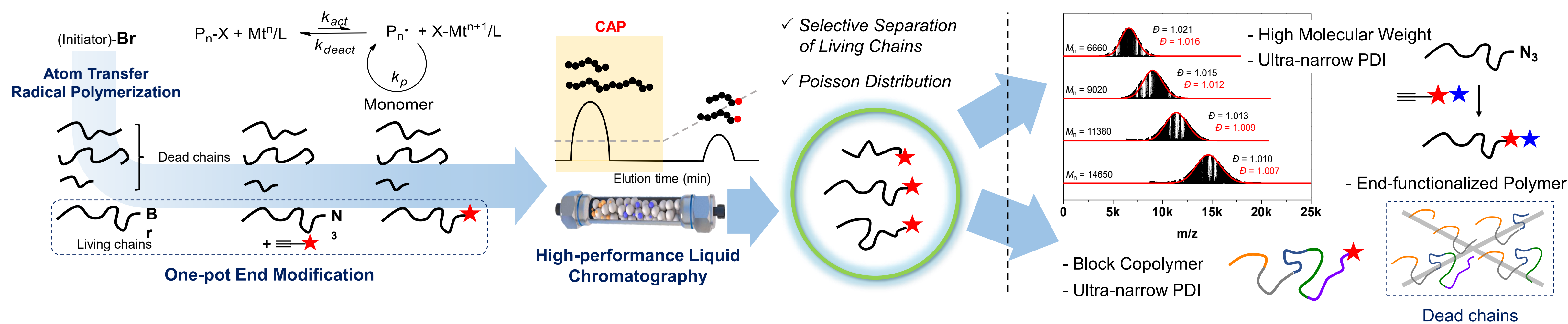
Abstract

Reversible deactivation radical polymerization (RDRP) is an effective method for achieving narrow polydispersity in polymers. However, the inevitable termination reactions broaden the polydispersity of polymers. In this study, we explore the potential for achieving **ultra-narrow polydispersity in acrylic polymers** by using high-performance liquid chromatography (HPLC) to **separate living and dead chains**. We conducted a quantitative analysis of the living/dead chain molar ratio in poly(benzyl acrylate) synthesized *via* **activators regenerated by electron transfer (ARGET) ATRP**. To achieve separation, we converted bromine end groups on living chains to various polar functional groups through azidation and CuAAC click reactions. The molecular weight distribution of the separated living chains was confirmed to be close to a Poisson distribution by MALDI-TOF MS. The results indicate the potential applicability of various acrylic-based polymers.

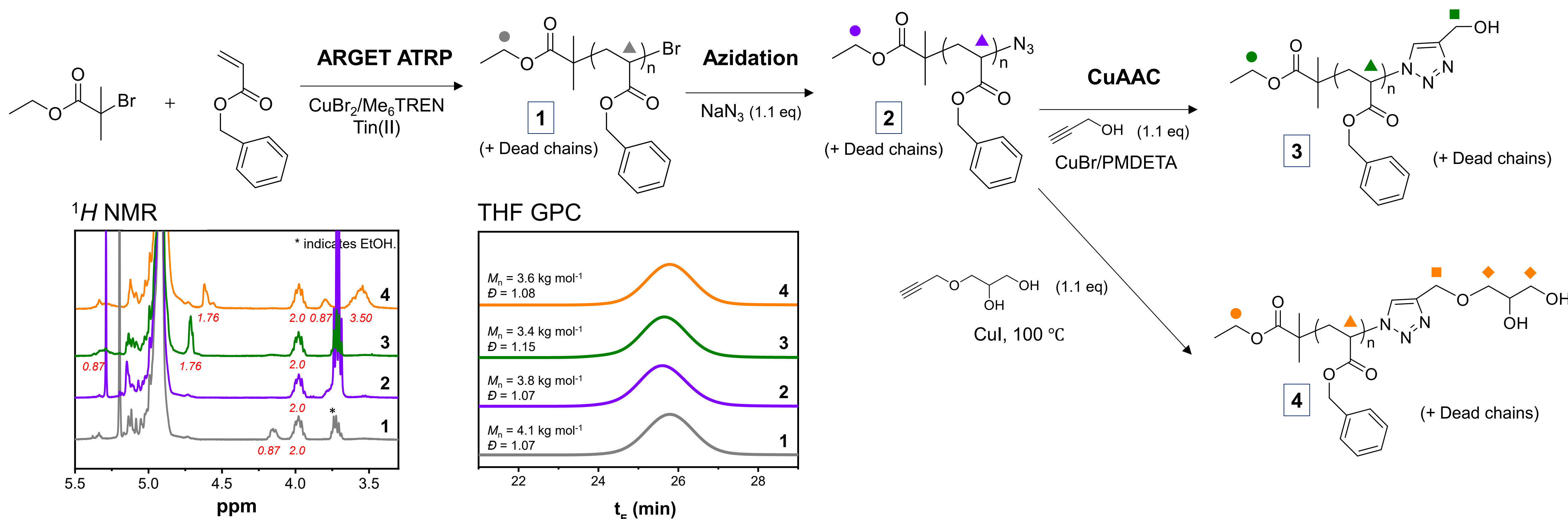
Molecular Weight Distribution for RDRP System



Research Concept

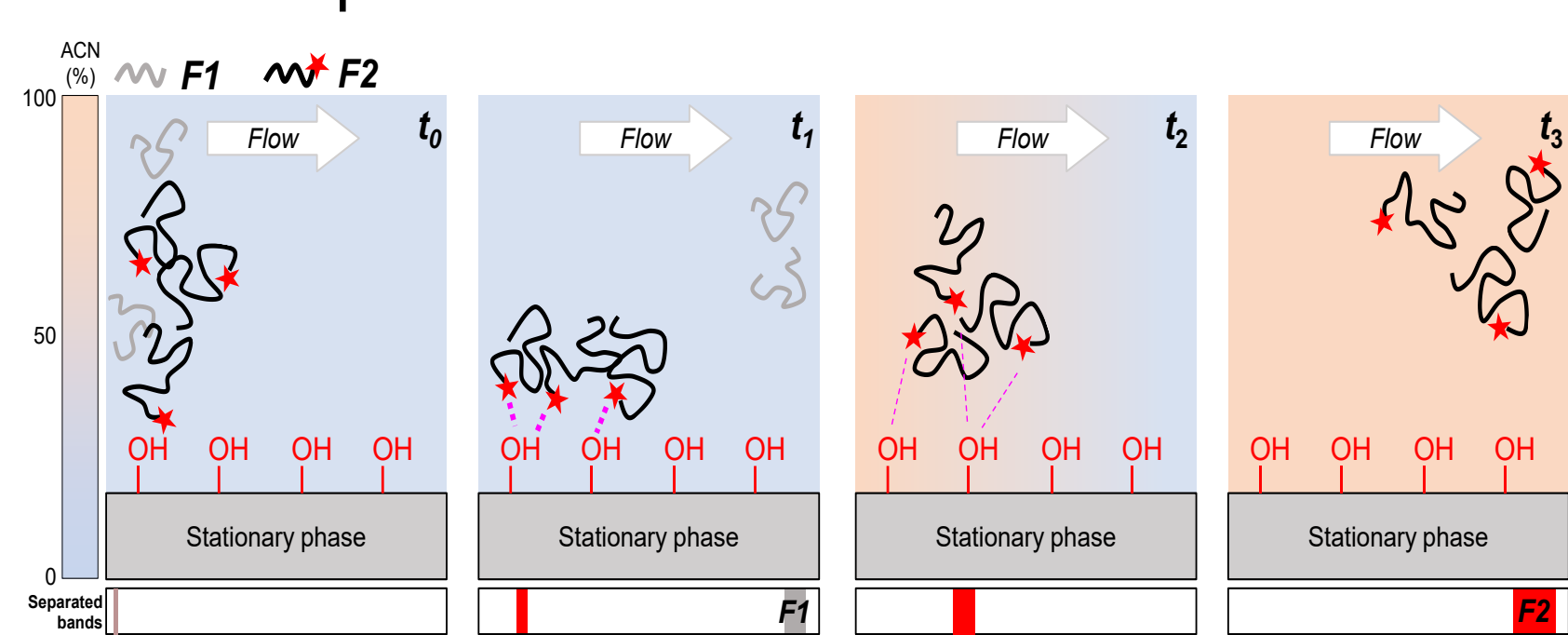


Synthesis & Chain-end Modification

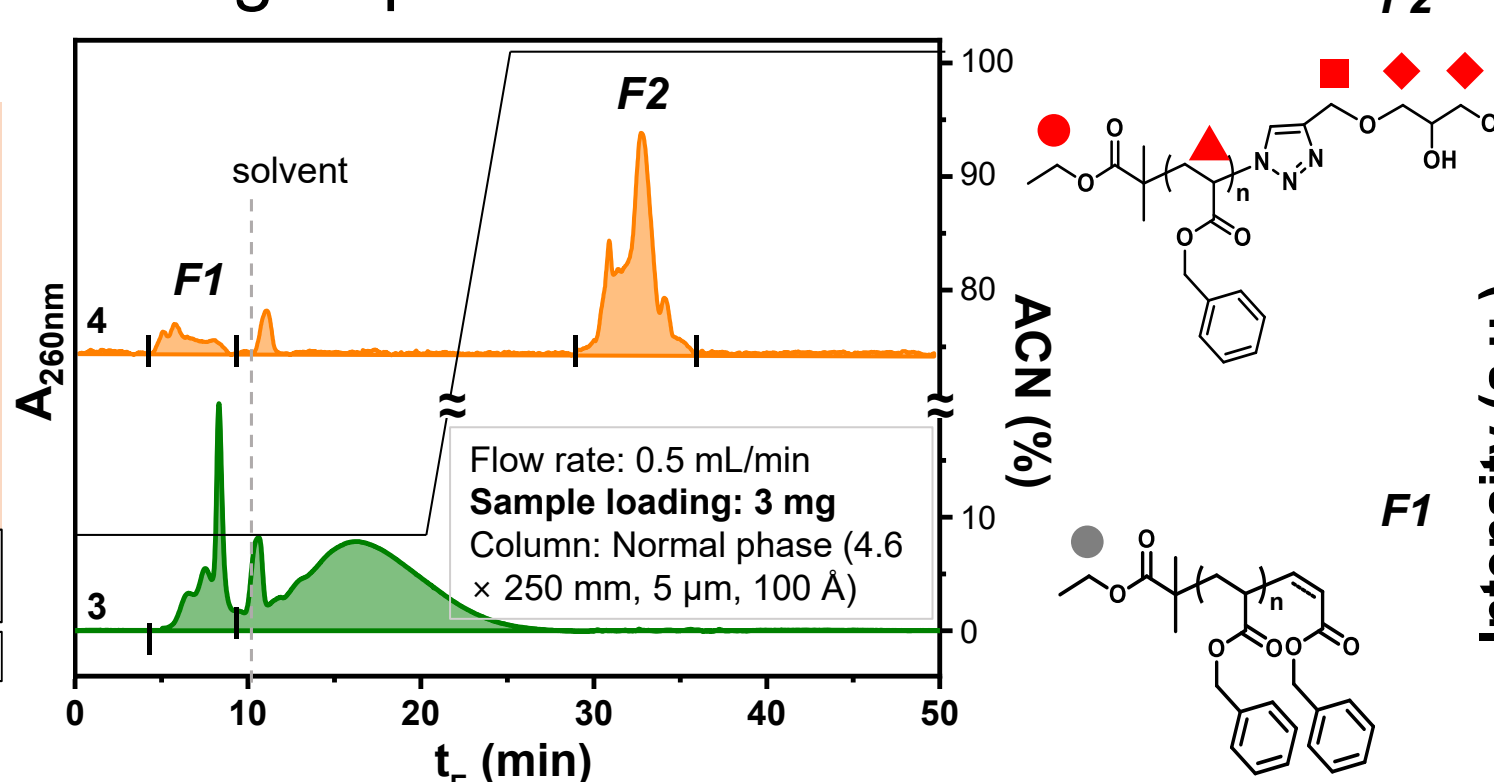


Separation of Living Chain

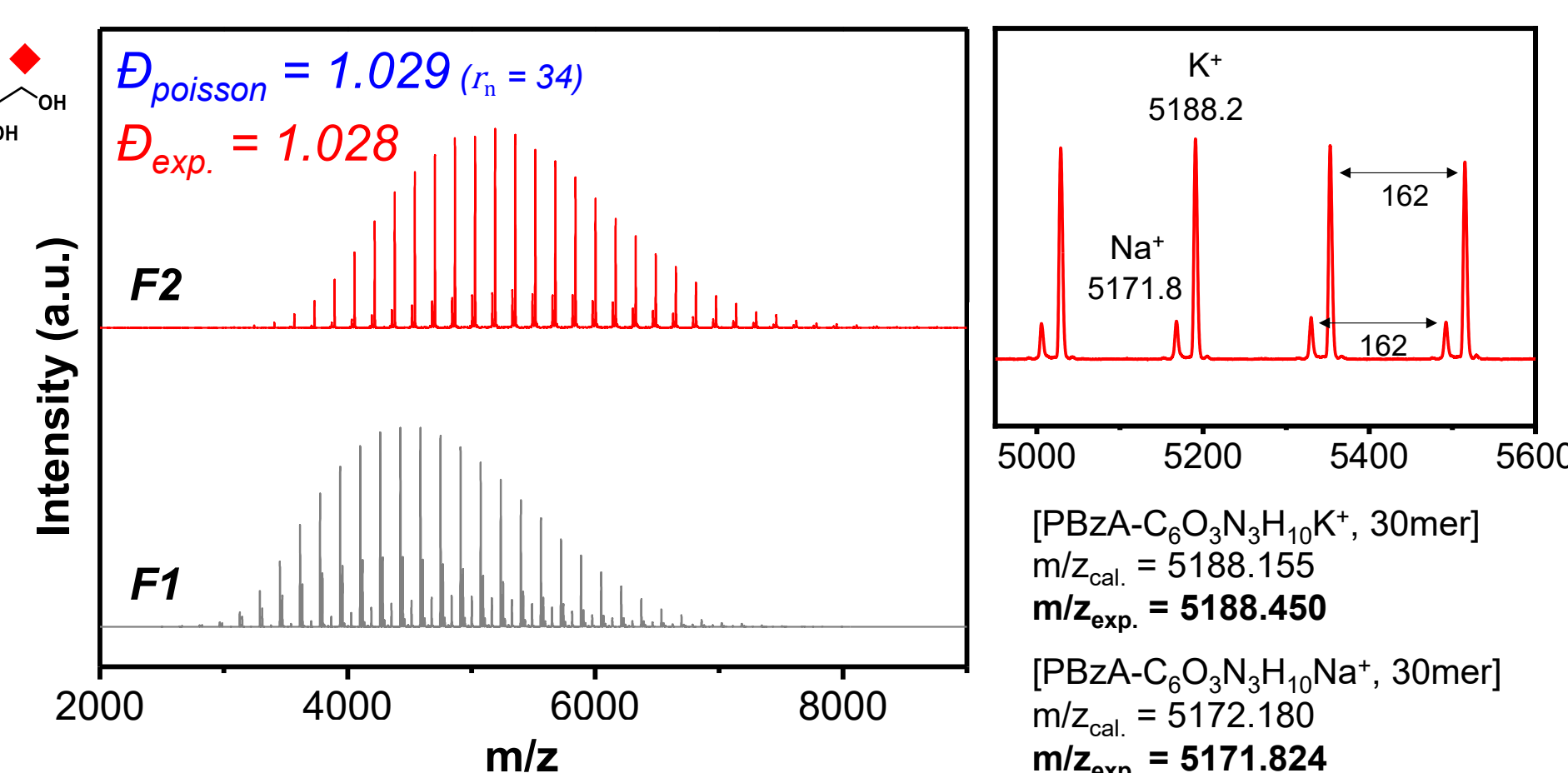
HPLC separation mechanism



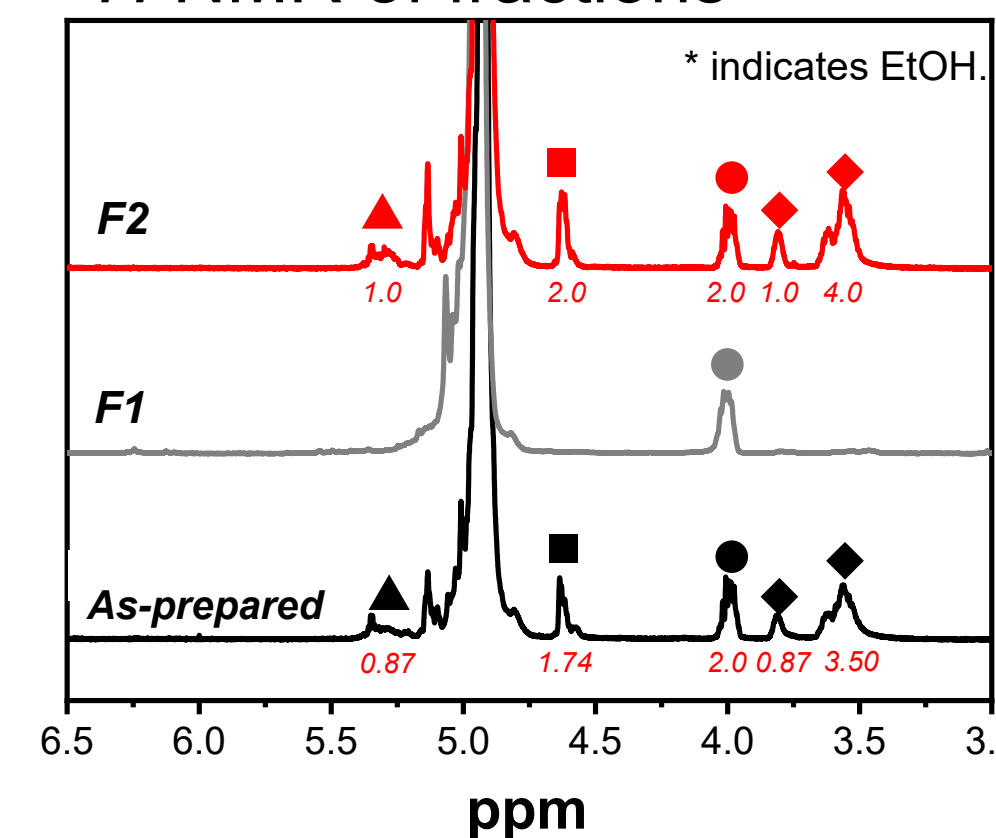
End-group driven fractionation



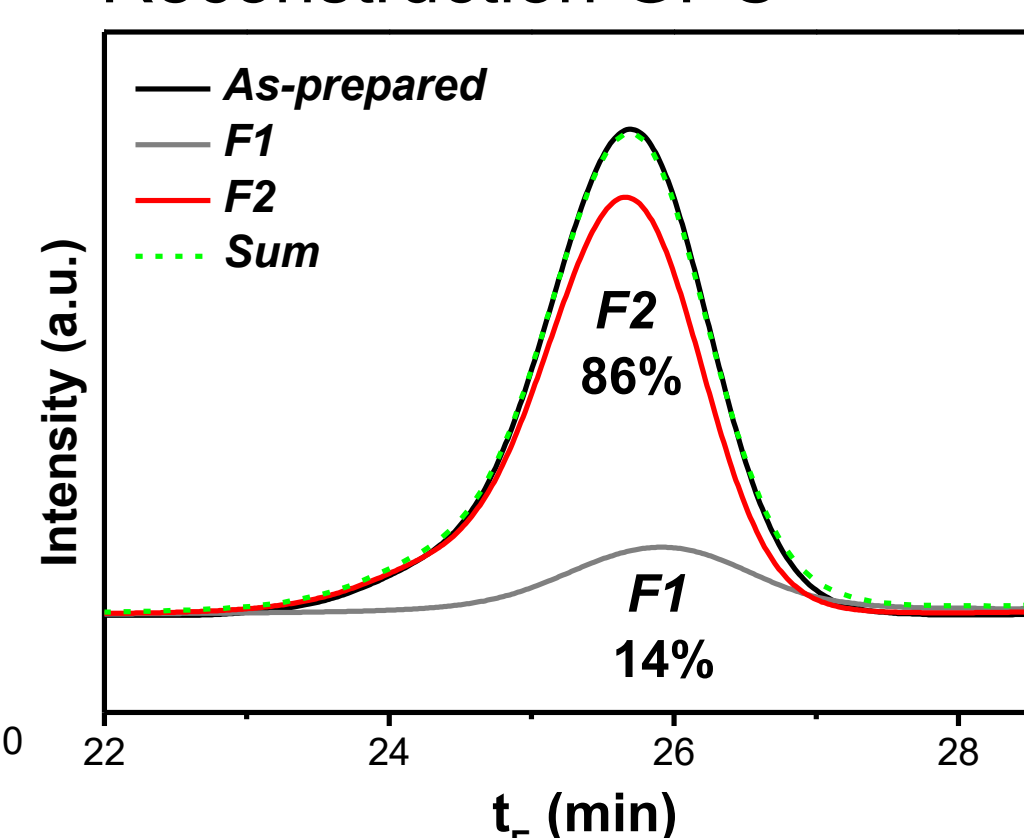
MALDI-TOF MS



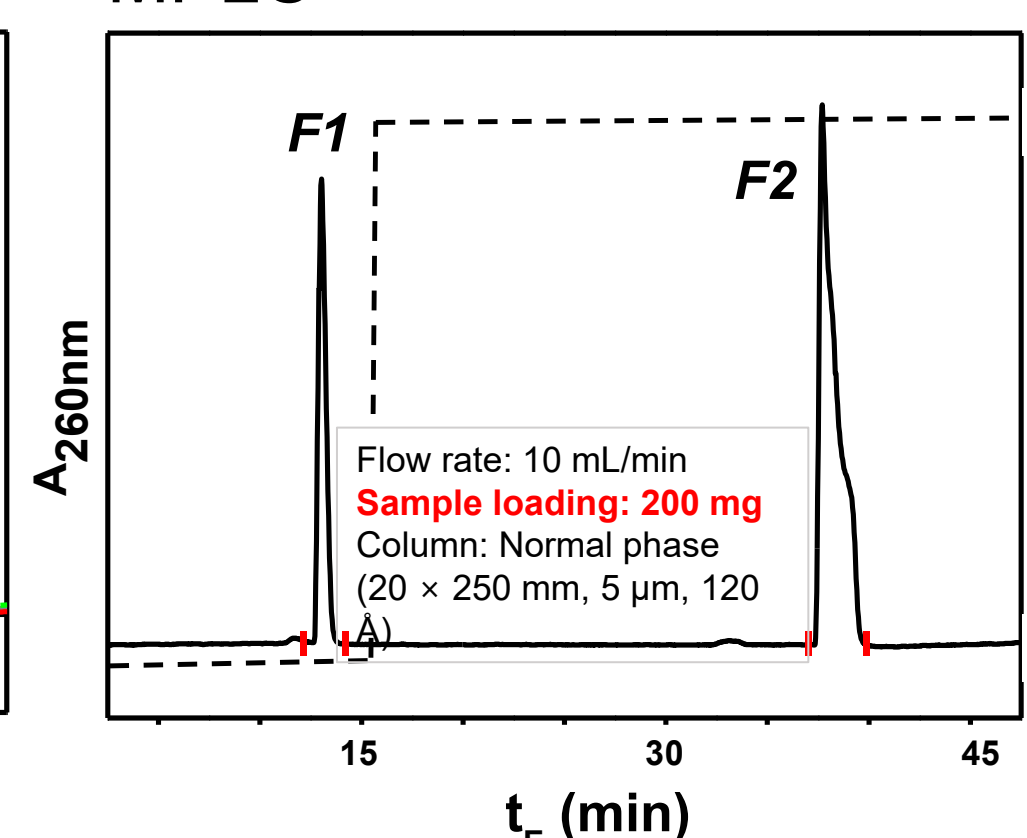
1H NMR of fractions



Reconstruction GPC



MPLC



Conclusion

- Poly(benzyl acrylate) with diverse end-groups was successfully synthesized *via* ARGET ATRP.
- Living chains were selectively separated and quantitatively analyzed using HPLC, ¹H NMR, and GPC.
- Molecular weight distribution matched the theoretical Poisson distribution.