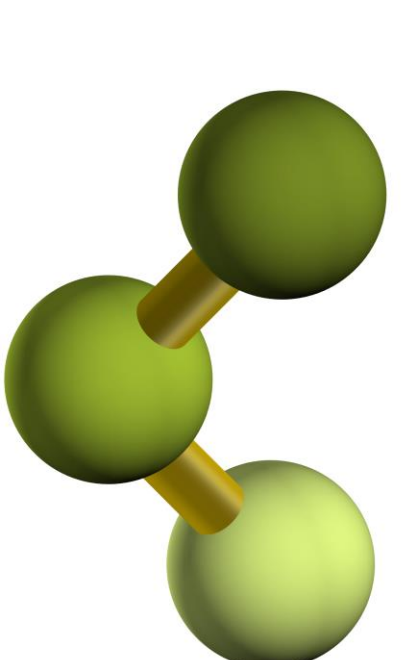




Sade Elizabeth Ige, Nathaniel Bingham and Peter Roth

School of Chemistry and Chemical Engineering, University of Surrey, Guildford, GU2 7XH

s.ige@surrey.ac.uk

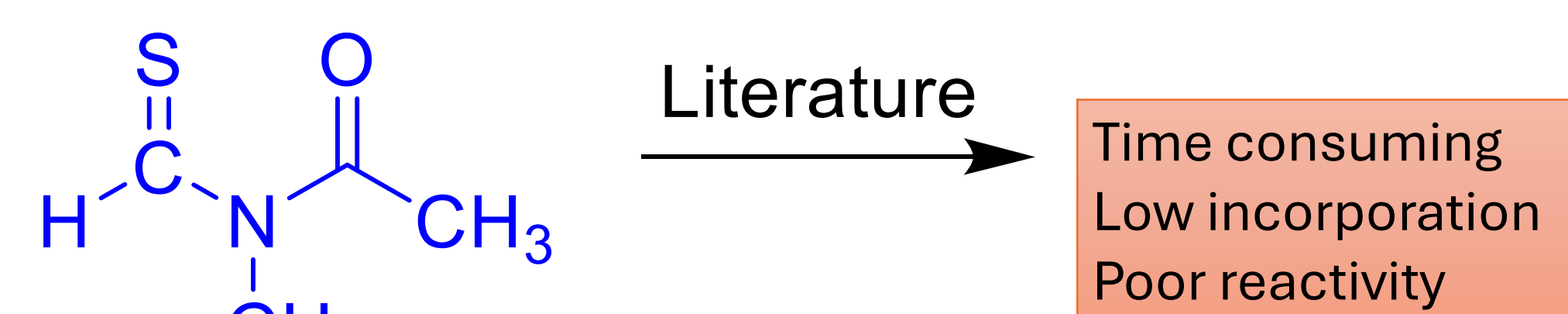
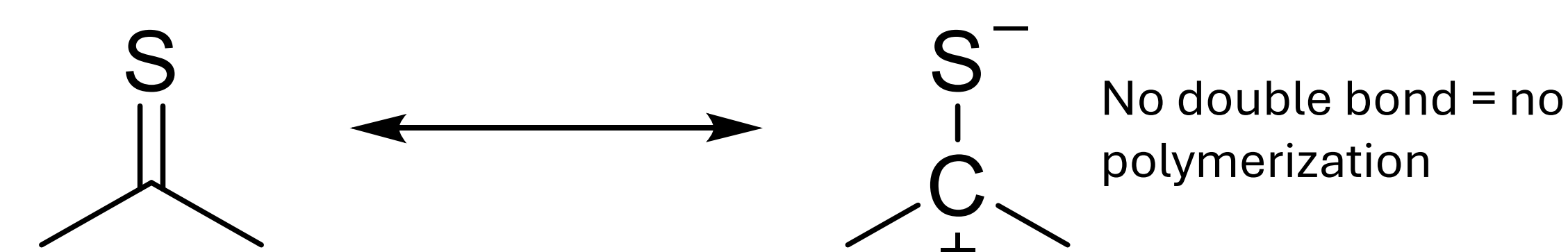
Introduction

Vinyl polymers, often called plastics, are versatile materials with excellent physical and chemical properties. Their otherwise **non-cleavable -C-C-** backbones are made degradable by incorporating different group of atoms through **copolymerization**.

Sulfur-containing compounds introduce thioester, thioether, thioamide, thioacetal and thioaminal functionalities into the backbone of vinyl polymers and promote their **degradation**. Among such compounds are allyl sulfide lactones, thionolactones and cyclic disulfides.¹ The first acyclic member of this group is **thioformamide** which was introduced in 2023 by Watanabe and Kamigaito.²

Degradable vinyl polymers promote **circular plastic economy** and ensure environmental preservation.³ Kiel *et al.*, 2022 reported the chemical deconstruction and **recycling of vinyl polymers** using **thionolactones** as the cleavable comonomer.⁴

The Challenge



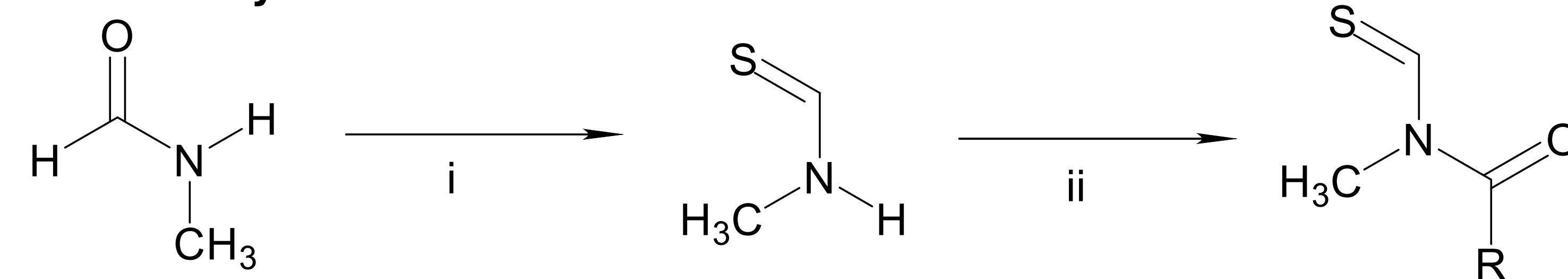
Herein, we introduced a novel thioformamide monomer which successfully incorporated degradable units into the backbone of its vinyl copolymers

Conclusion

- Synthesized a novel monomer which is chemically stable and compatible with a range of vinyl monomers
- RAFT polymerisation gave narrowly dispersed polymers
- Copolymers were successfully degraded using AgNO₃, bleach, DMF, and UV.
- Other derivatives of the monomer has been synthesized and currently exploring their reactivity

Methodology

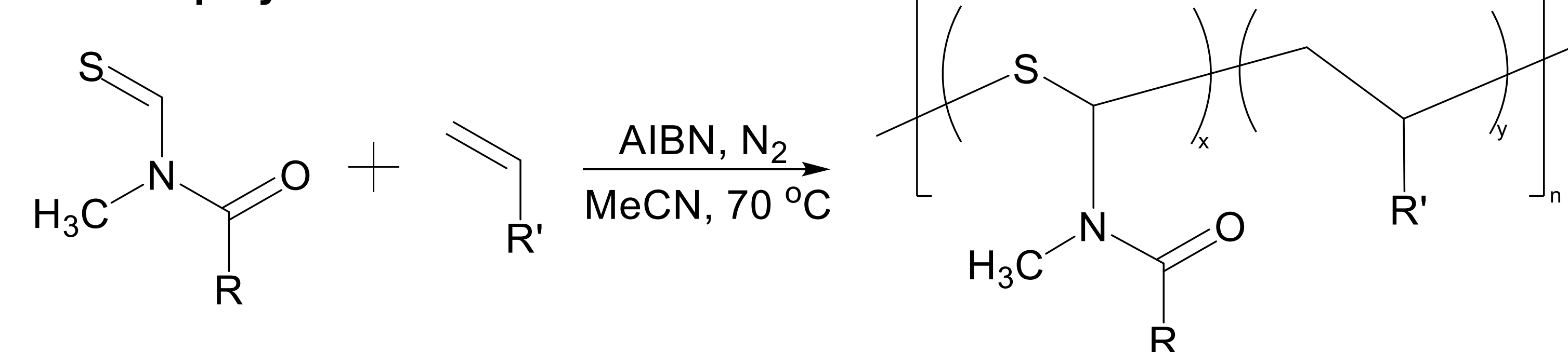
Monomer synthesis



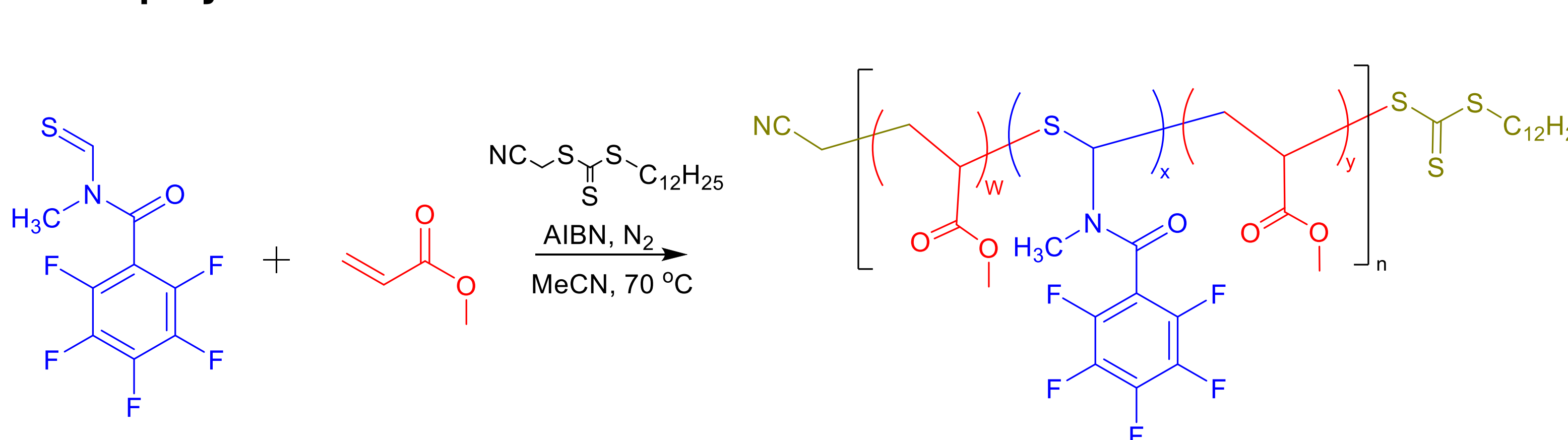
i) Lawesson's reagent, THF, 25 °C

ii) Acyl chloride, triethylamine, EtOAc, 0-RT

Radical polymerisation



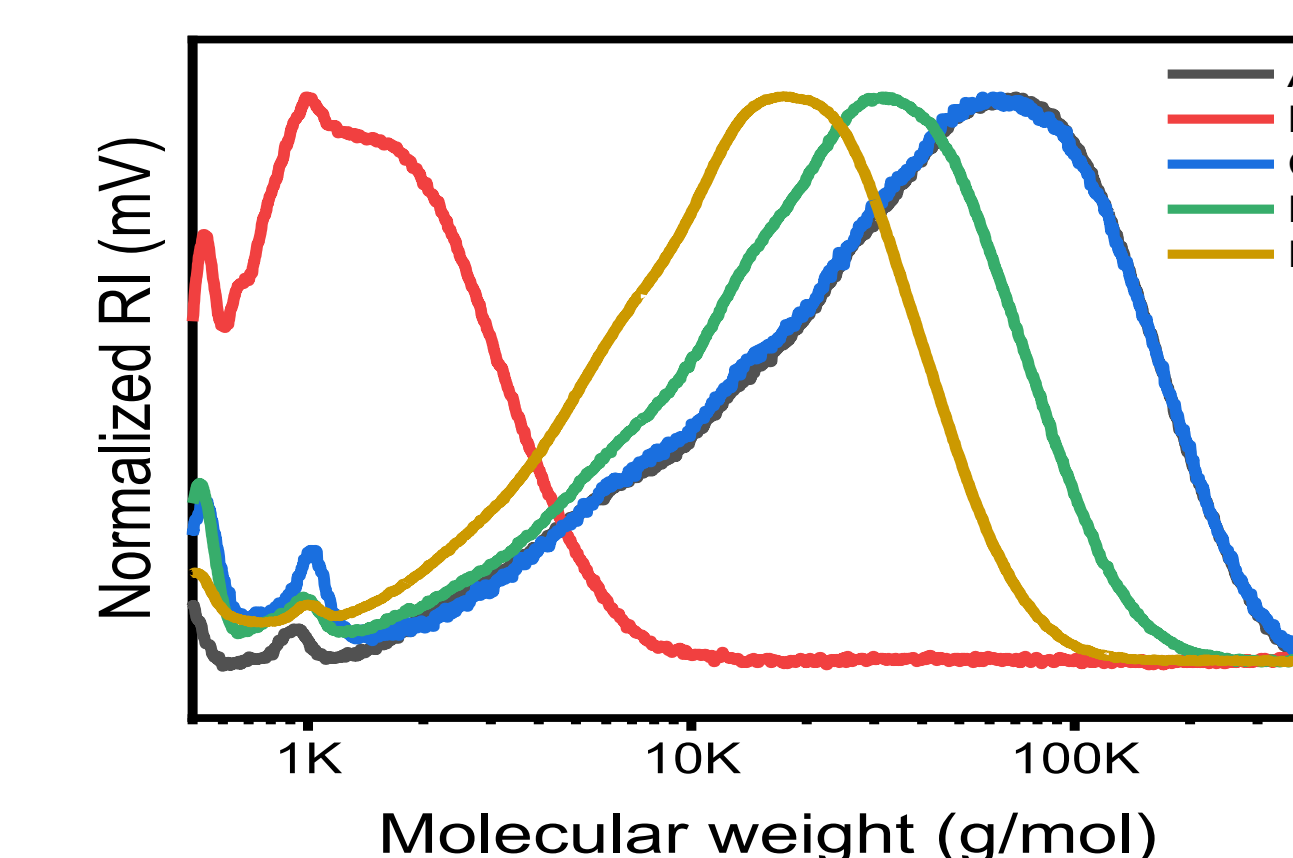
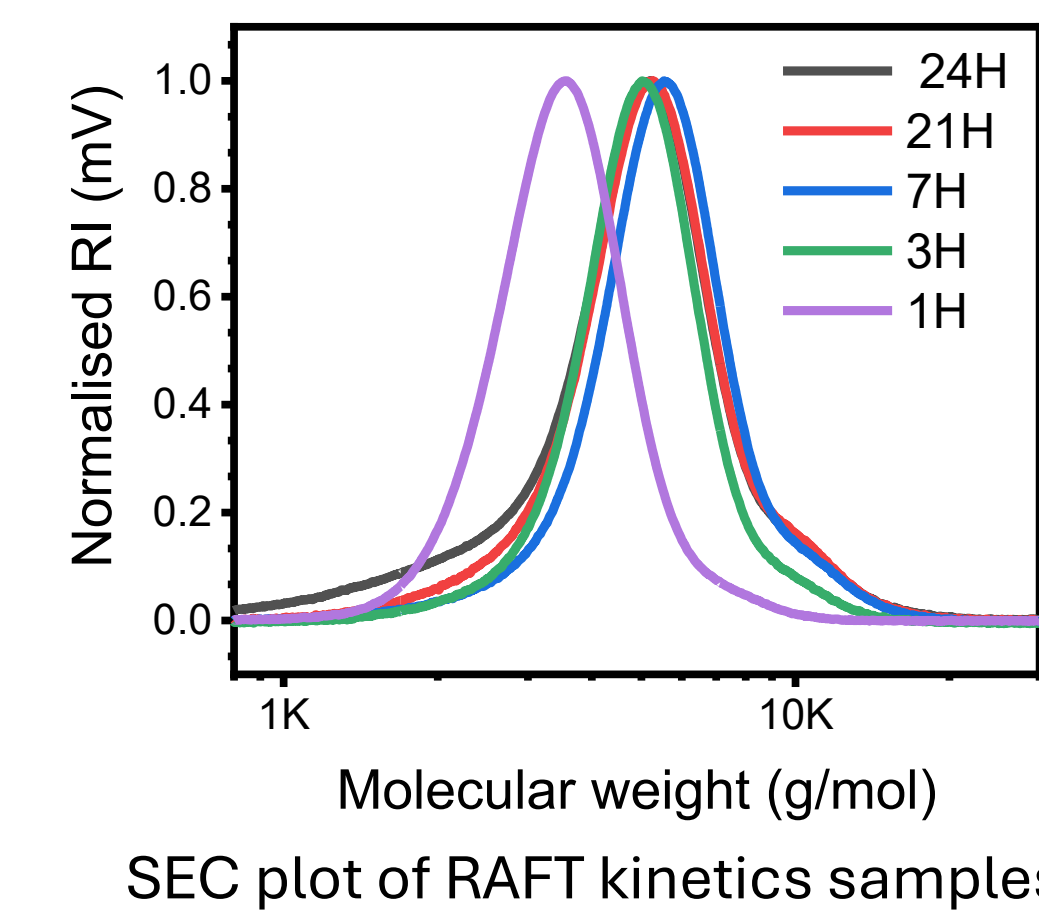
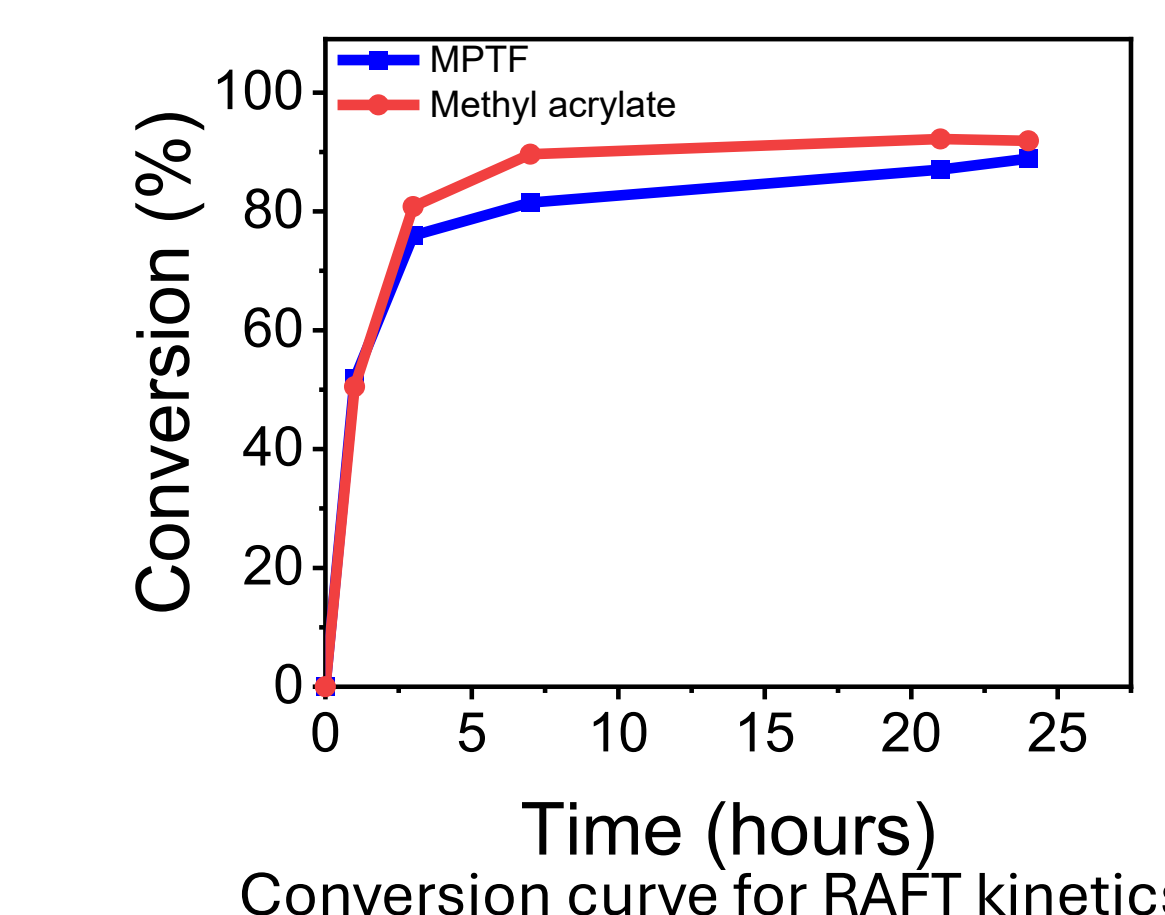
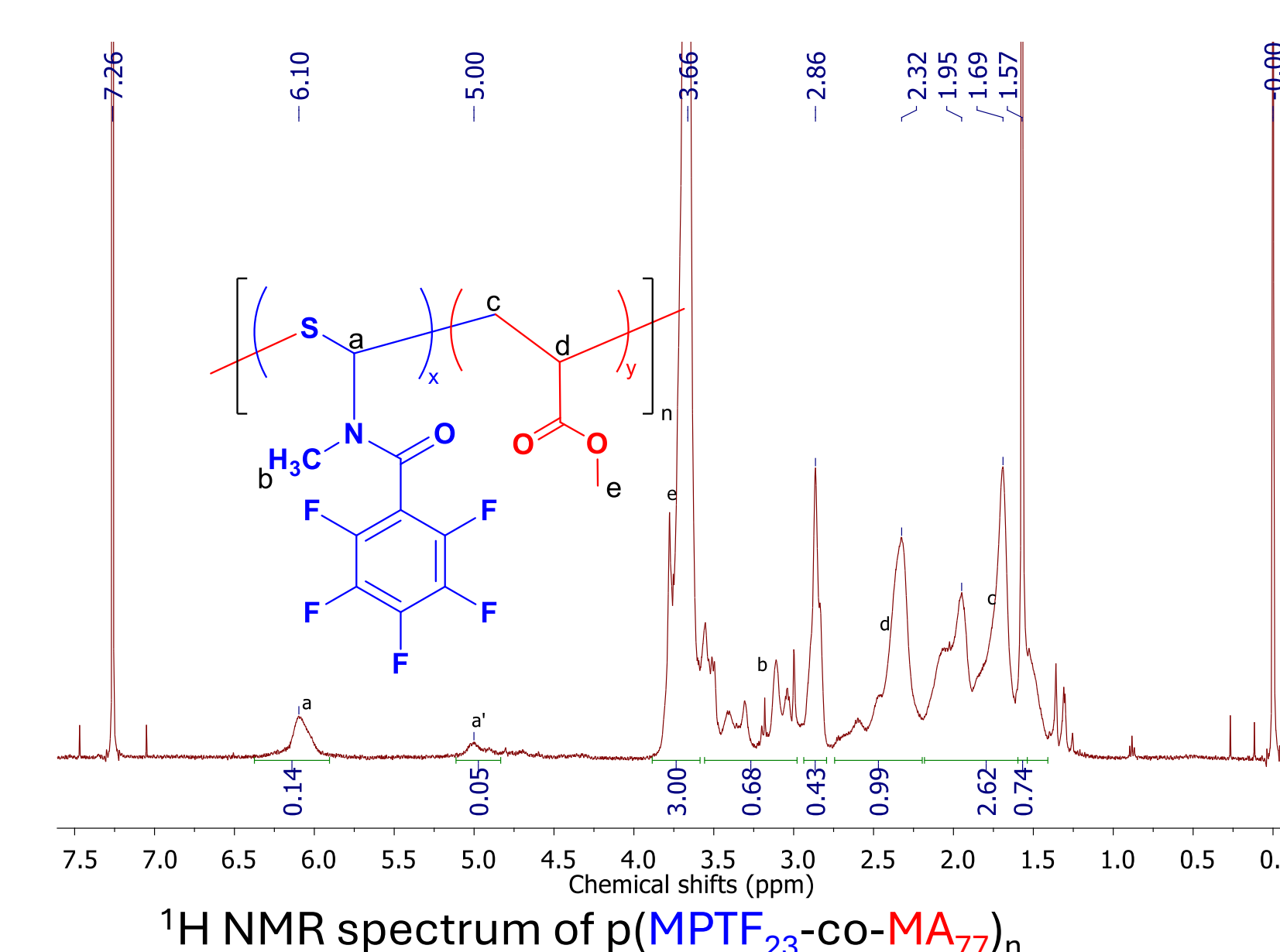
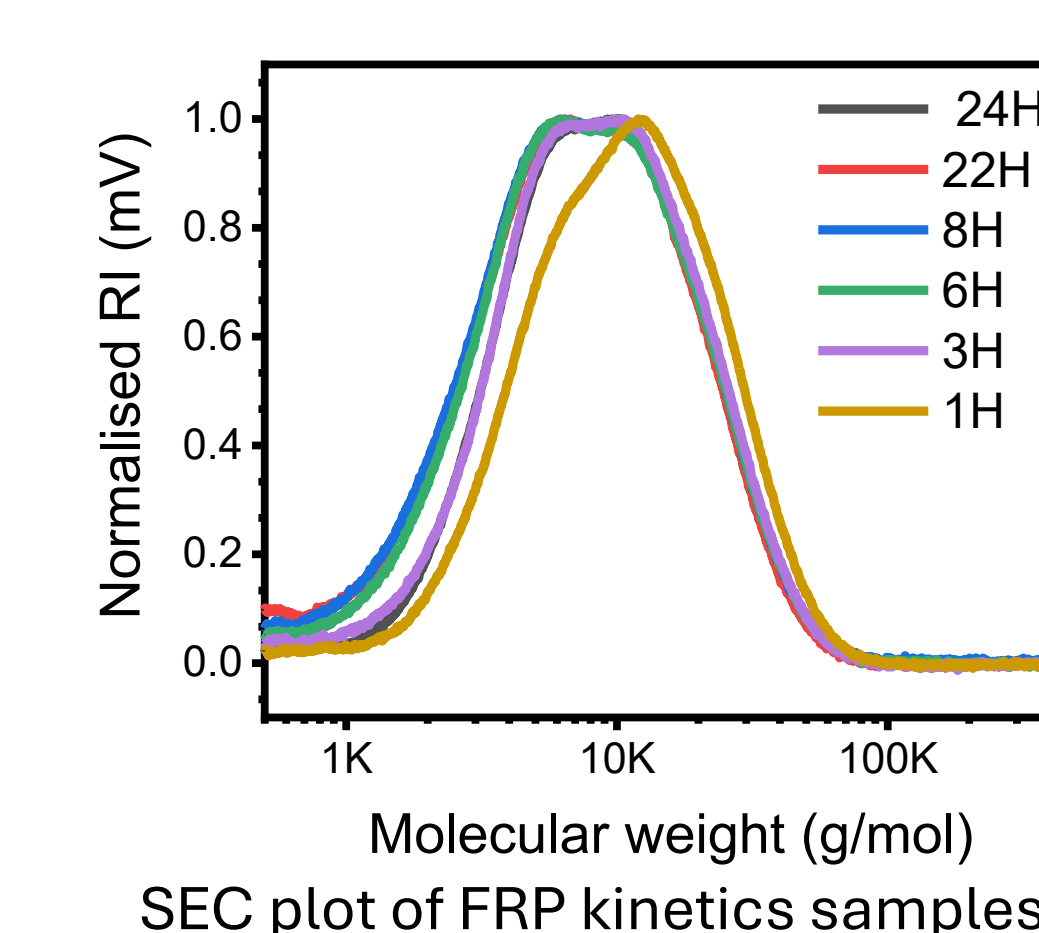
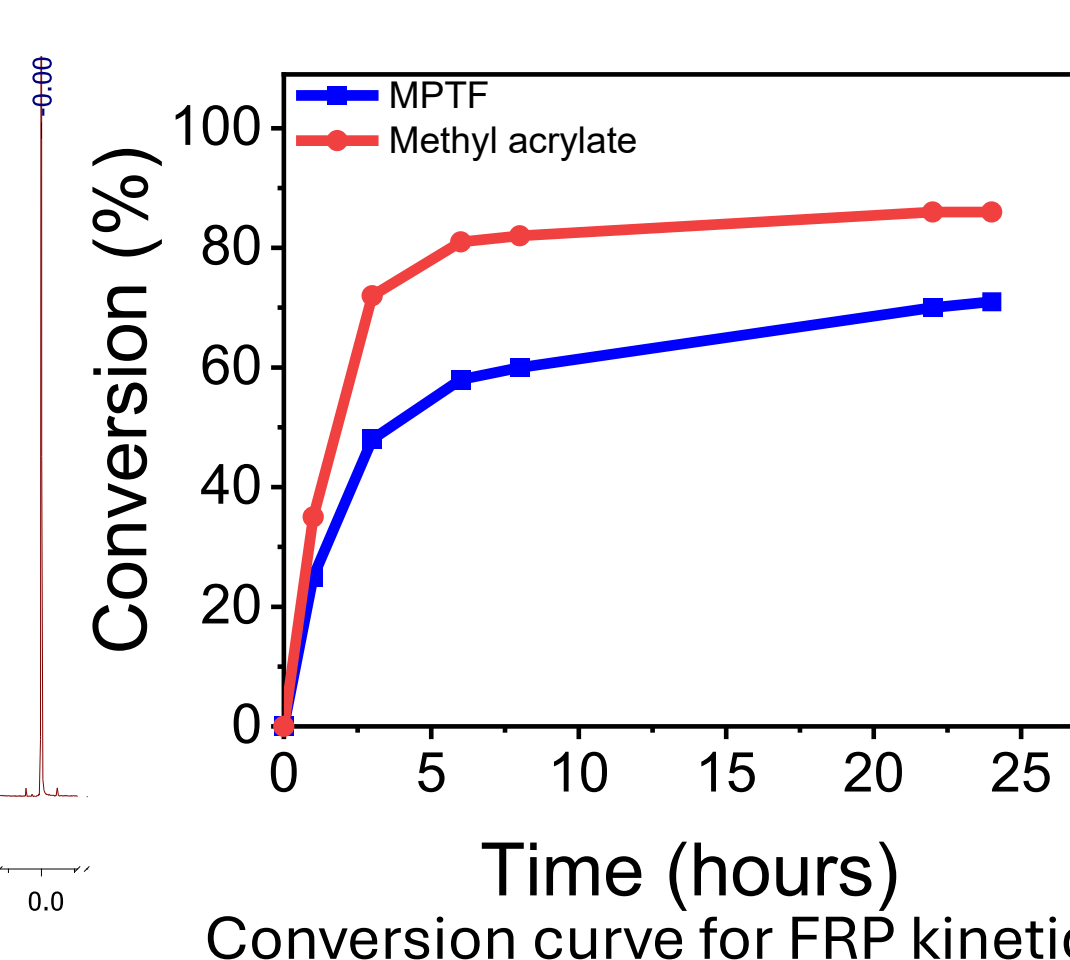
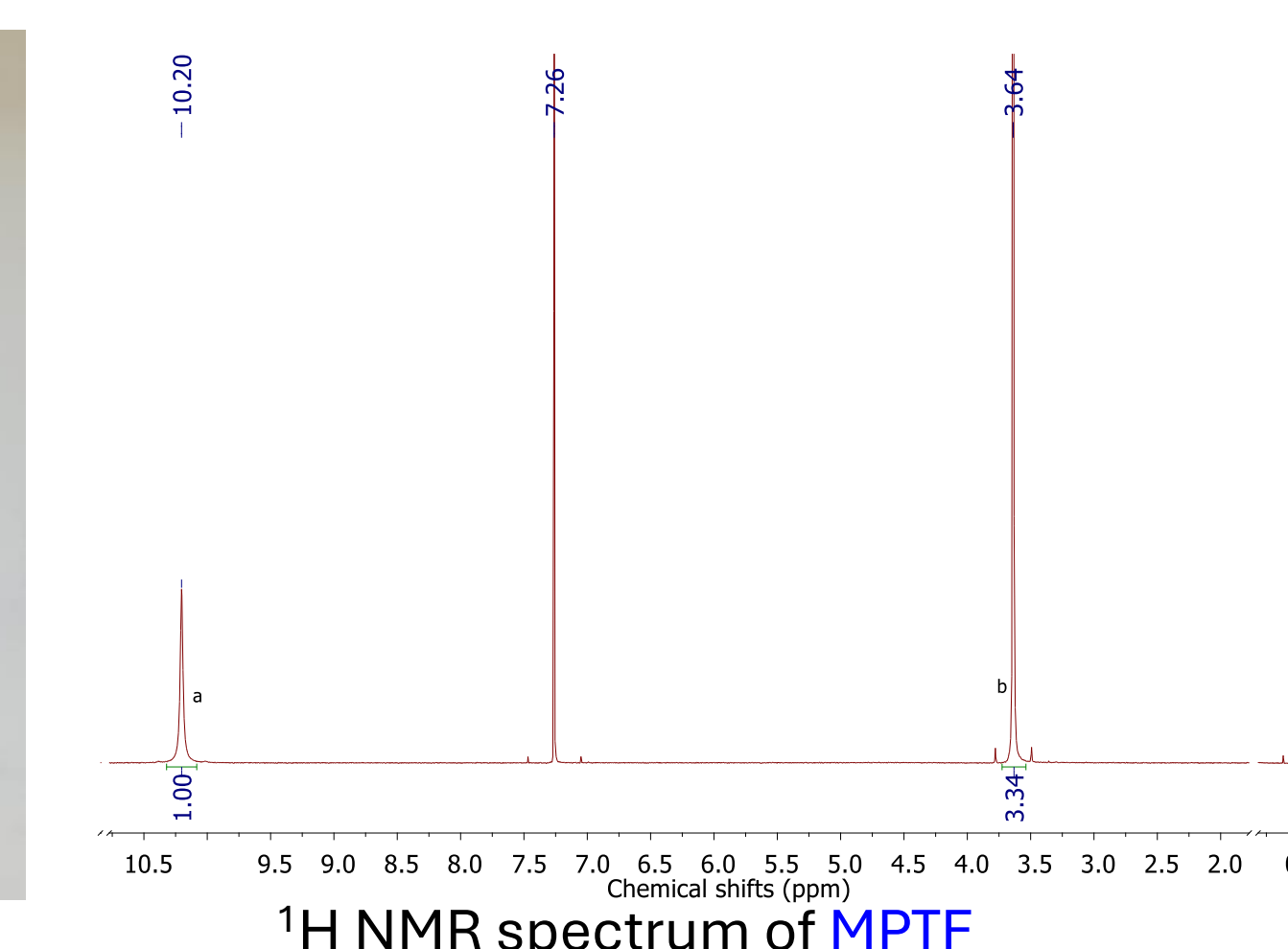
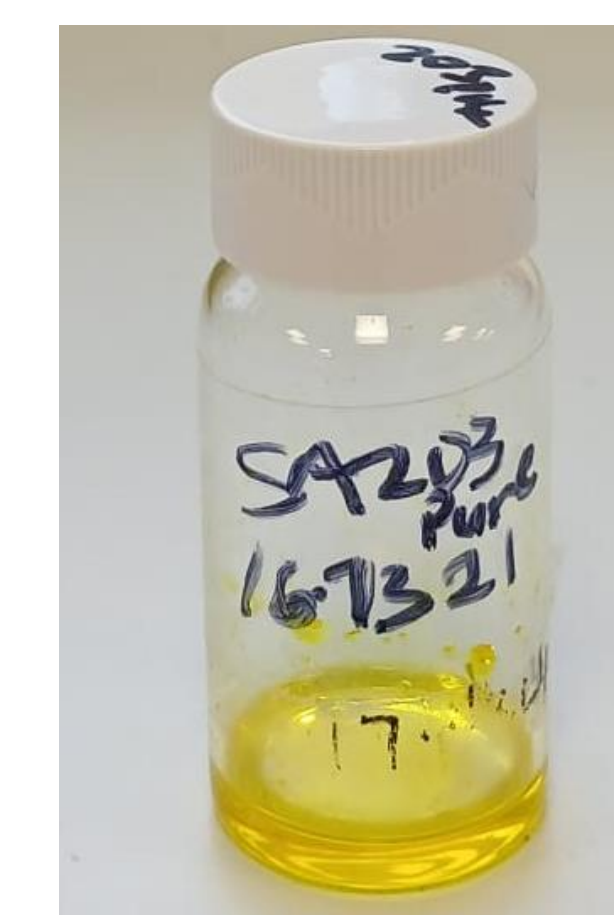
RAFT polymerisation



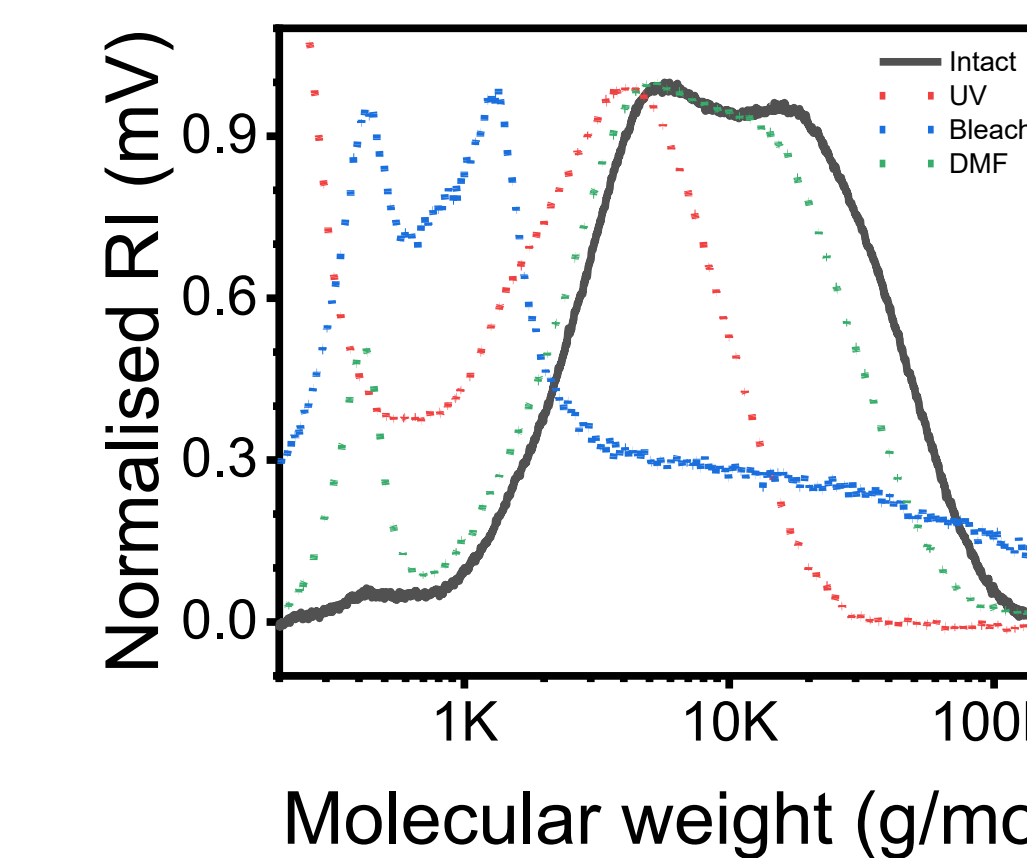
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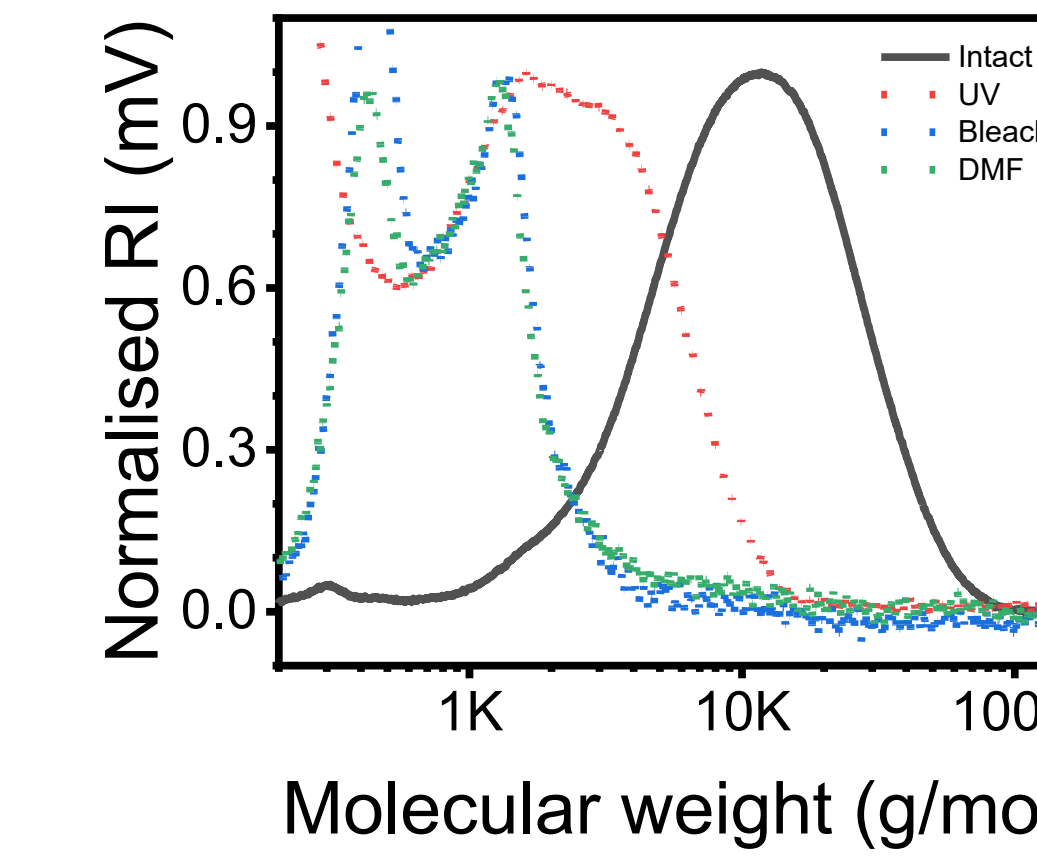
Results



SEC curves for the degradation of **p(MPTF₉-co-MA₉₁)_n**; intact (black), silver nitrate (B red), bleach (blue), DMF (green), and UV (yellow)



SEC curves for the degradation of **p(MPTF₂₃-co-MA₇₇)_n**



SEC curves for the degradation of **p(MPTF₅₀-co-VB₅₀)_n**

Acknowledgement

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