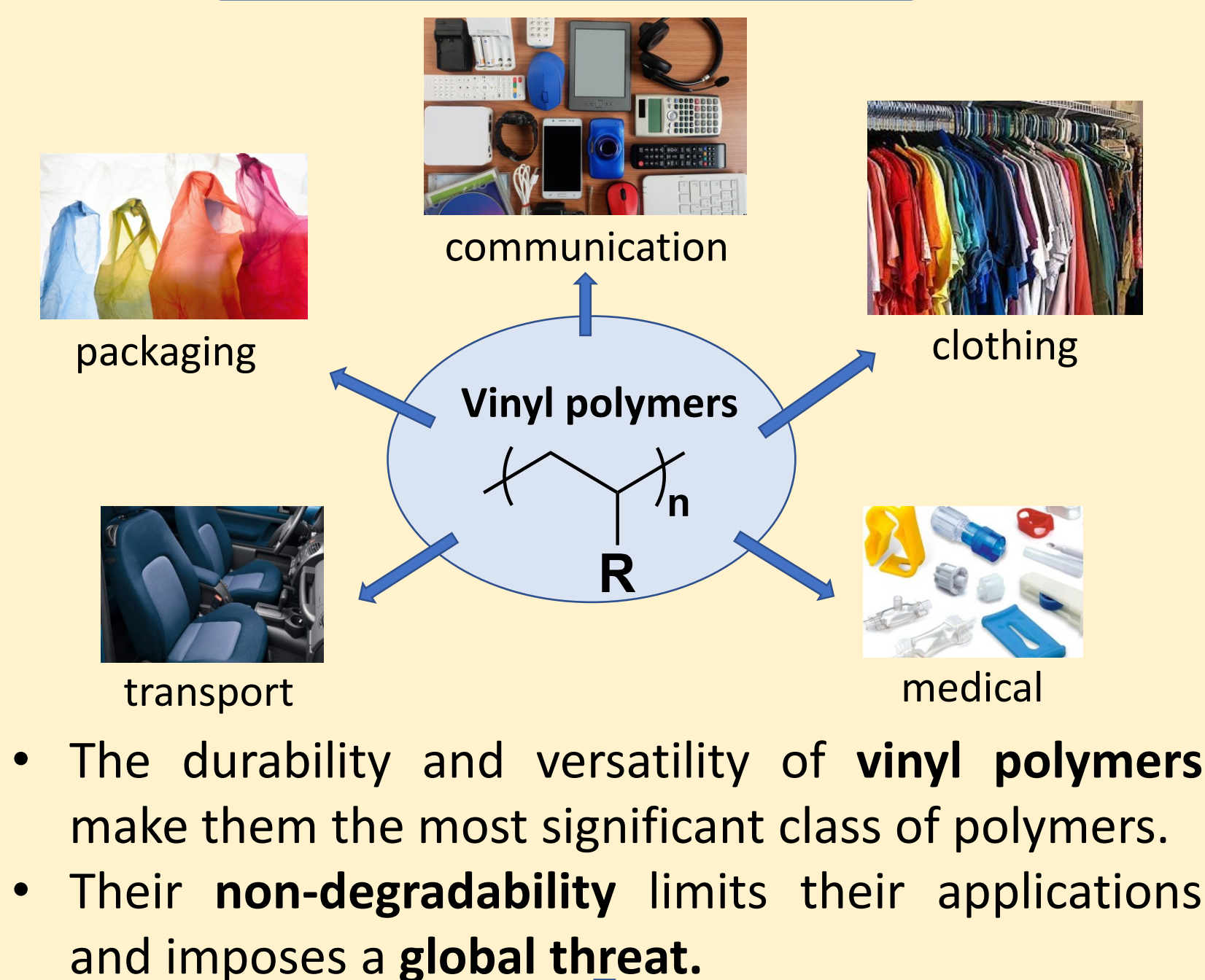


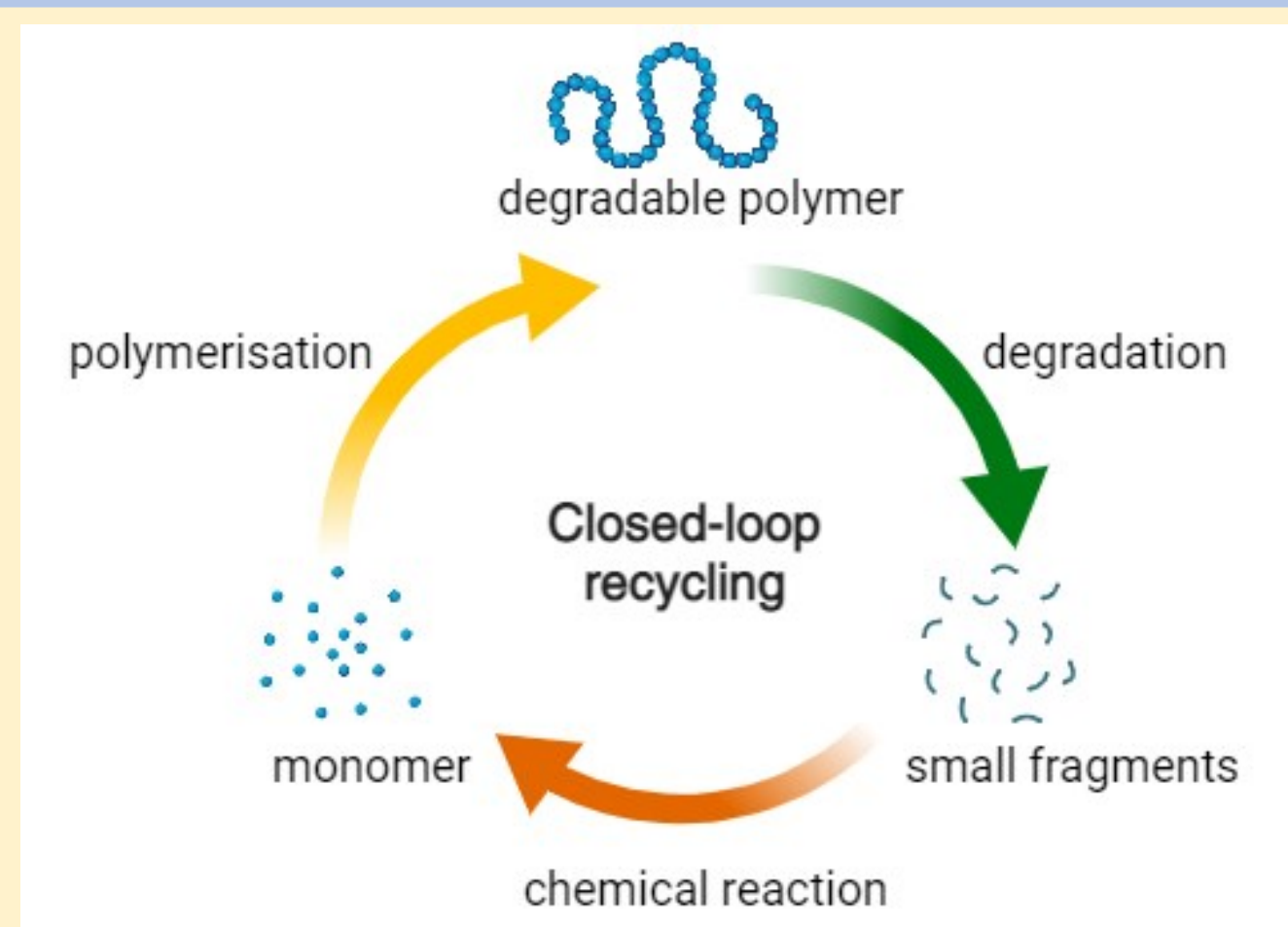
Swarnali Neogi, Qamar-un-Nisa, Rohani Abu Bakar, Nathaniel M. Bingham, Peter J. Roth

Department of Chemistry, School of Chemistry and Chemical Engineering, University of Surrey, Guildford GU2 7XH, UK. contact: p.roth@surrey.ac.uk

Introduction

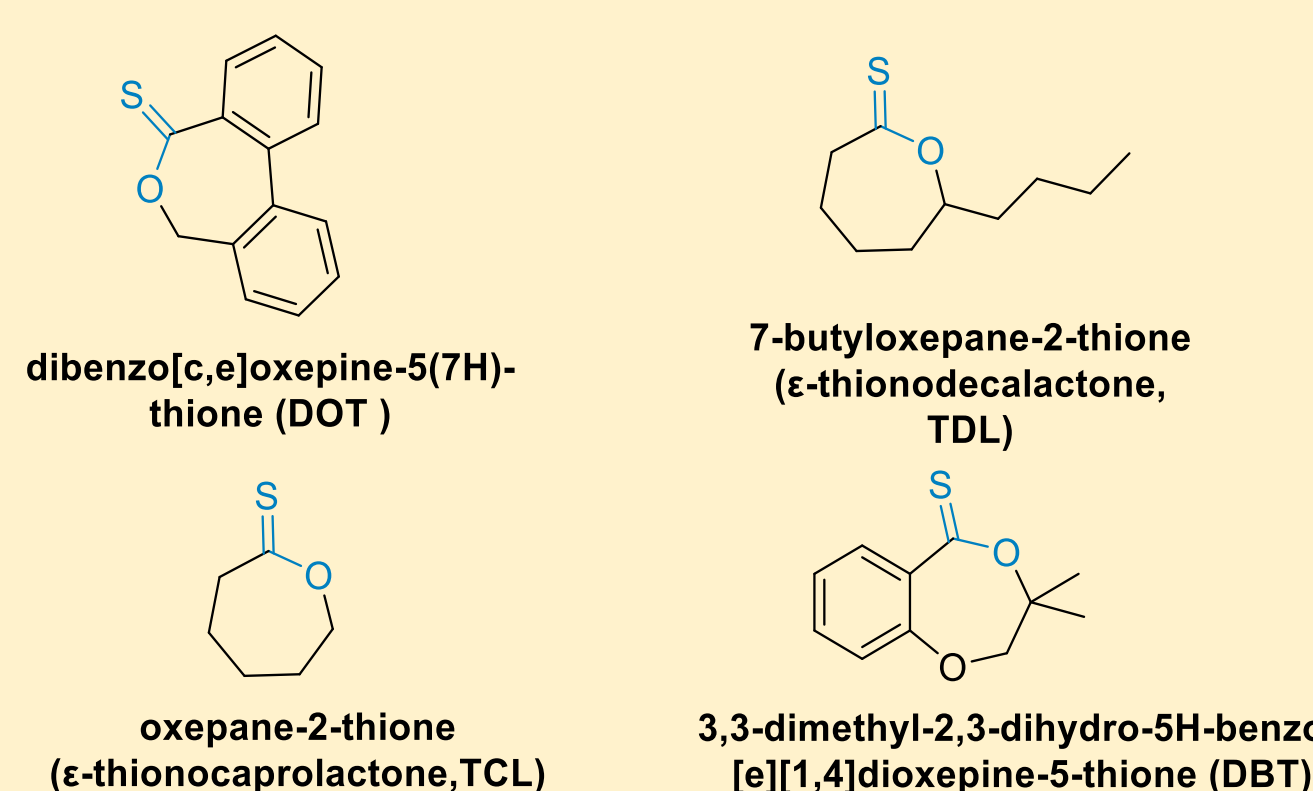


Solution: Degradable Polymers!



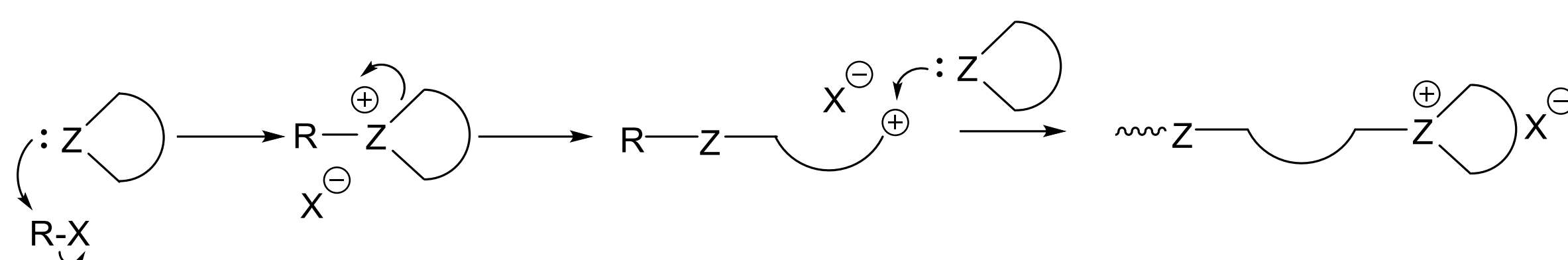
Purpose of this work

- Polymers with groups like **esters**, **thioesters** in their backbones are degradable.
- Thionolactone** monomers can install thioesters in polymers by **Ring-Opening Polymerisation (ROP)**.
- Some of the existing thionolactones.** [1], [2]



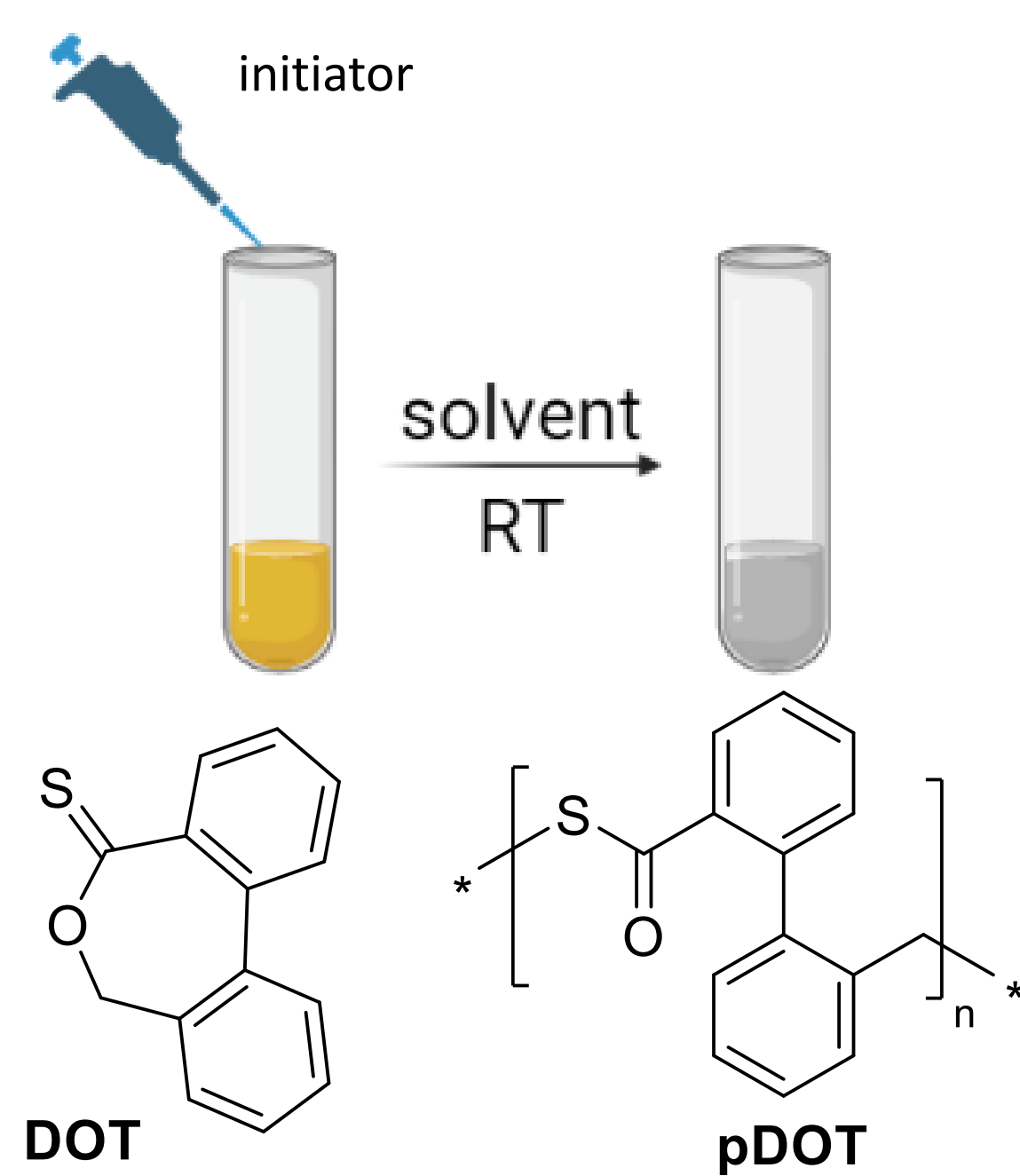
- DOT copolymerises radically with vinyl monomers but does not homopolymerize well by the established radical method.[3]
- A homopolymer of DOT (pDOT)** will have cleavable linkages in every repeat unit and should be fully degraded to into small molecules.
- Here we present **cationic ring-opening homopolymerisation (CROP)** of DOT.

Cationic Ring-Opening Polymerisation (CROP)

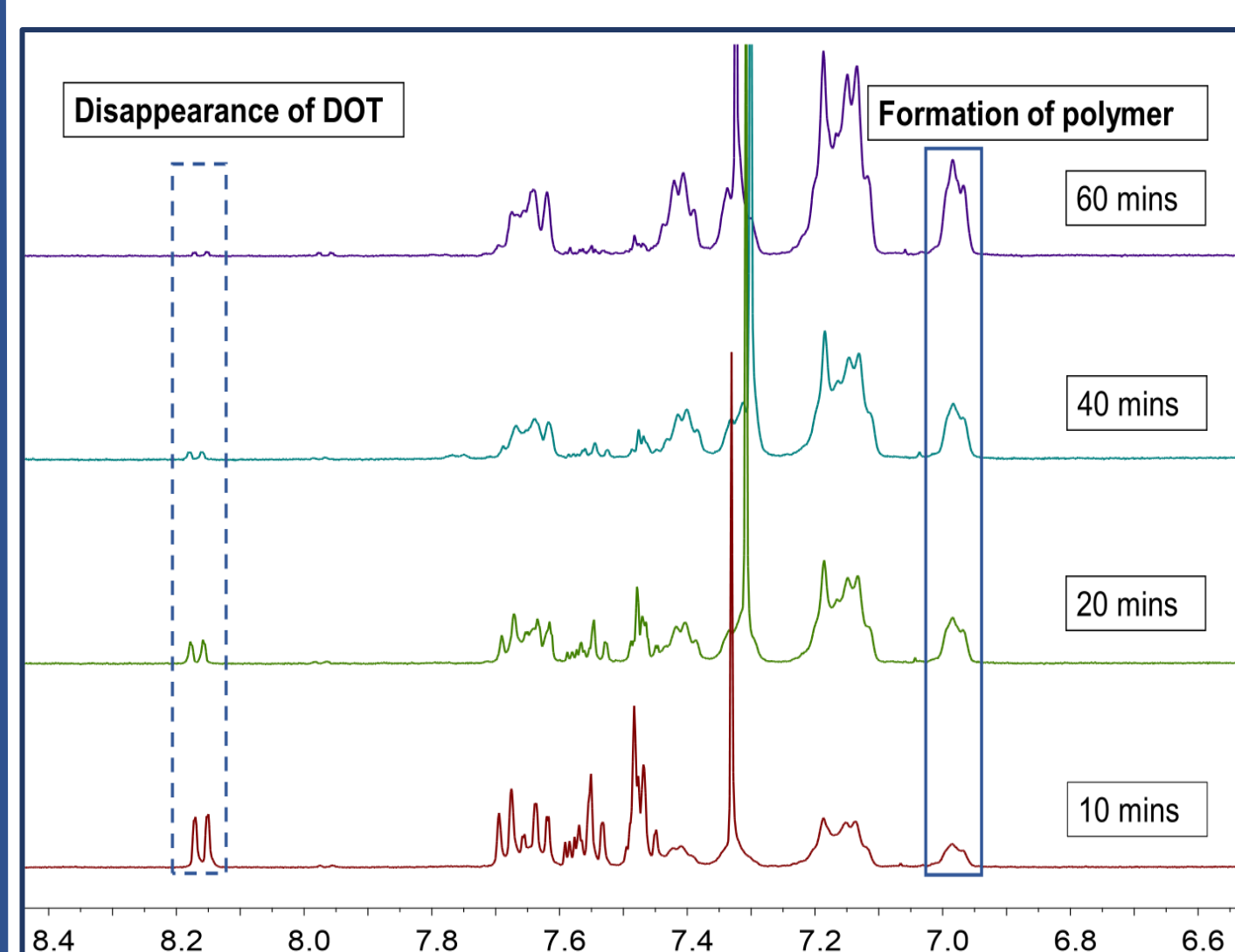
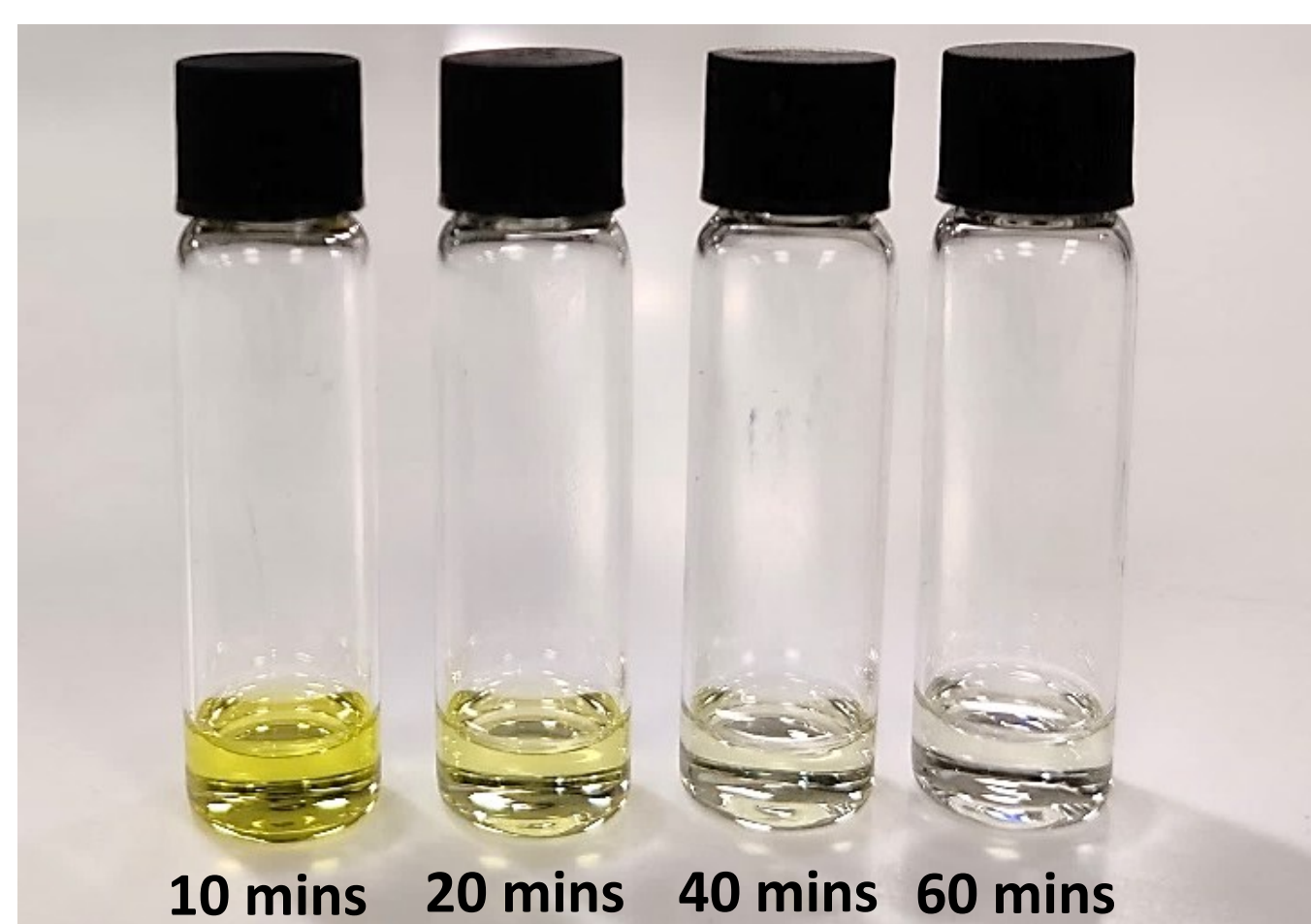


Heterocyclic monomers can be cationically polymerised by cationic ring-opening polymerisation (CROP).

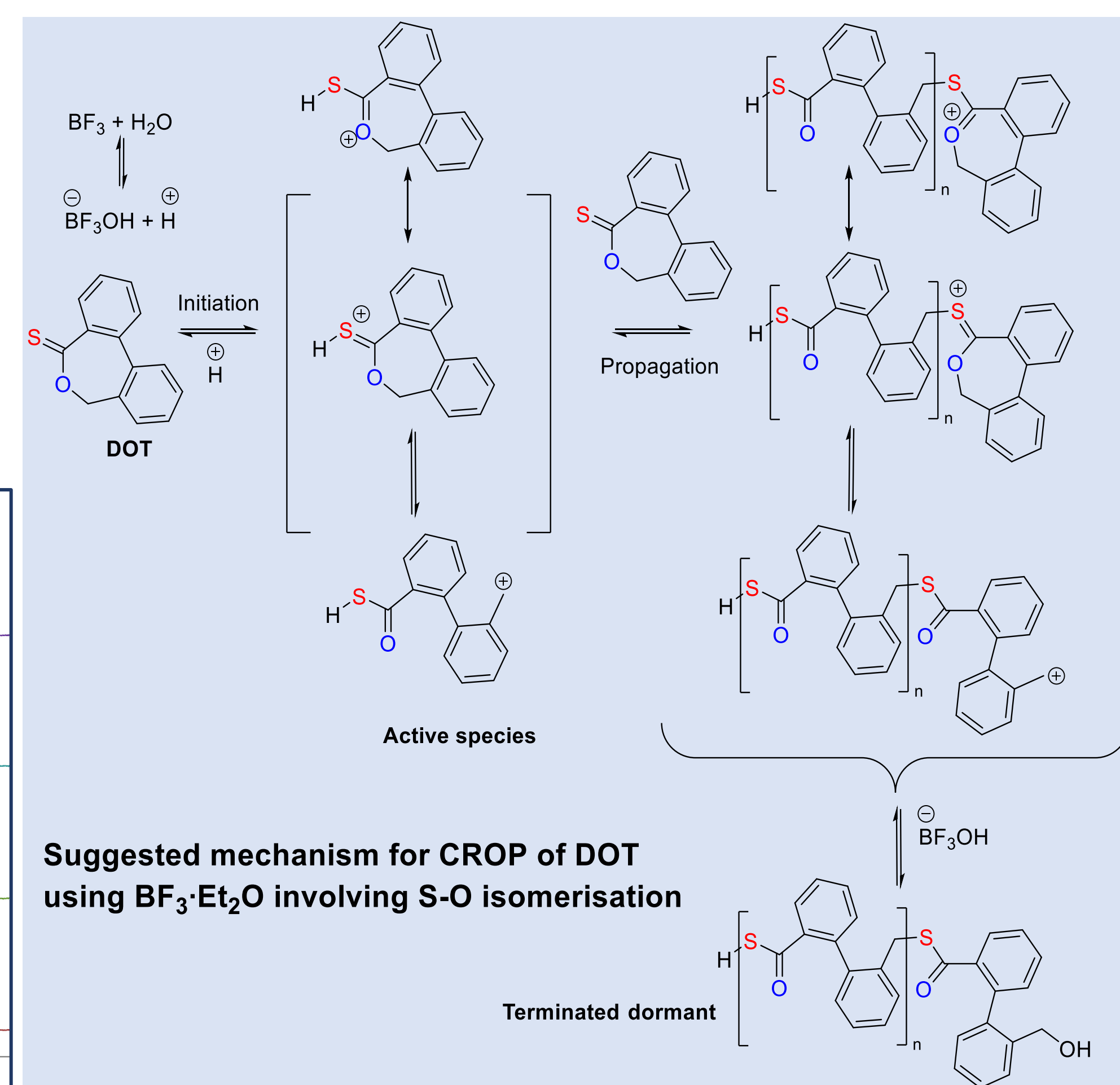
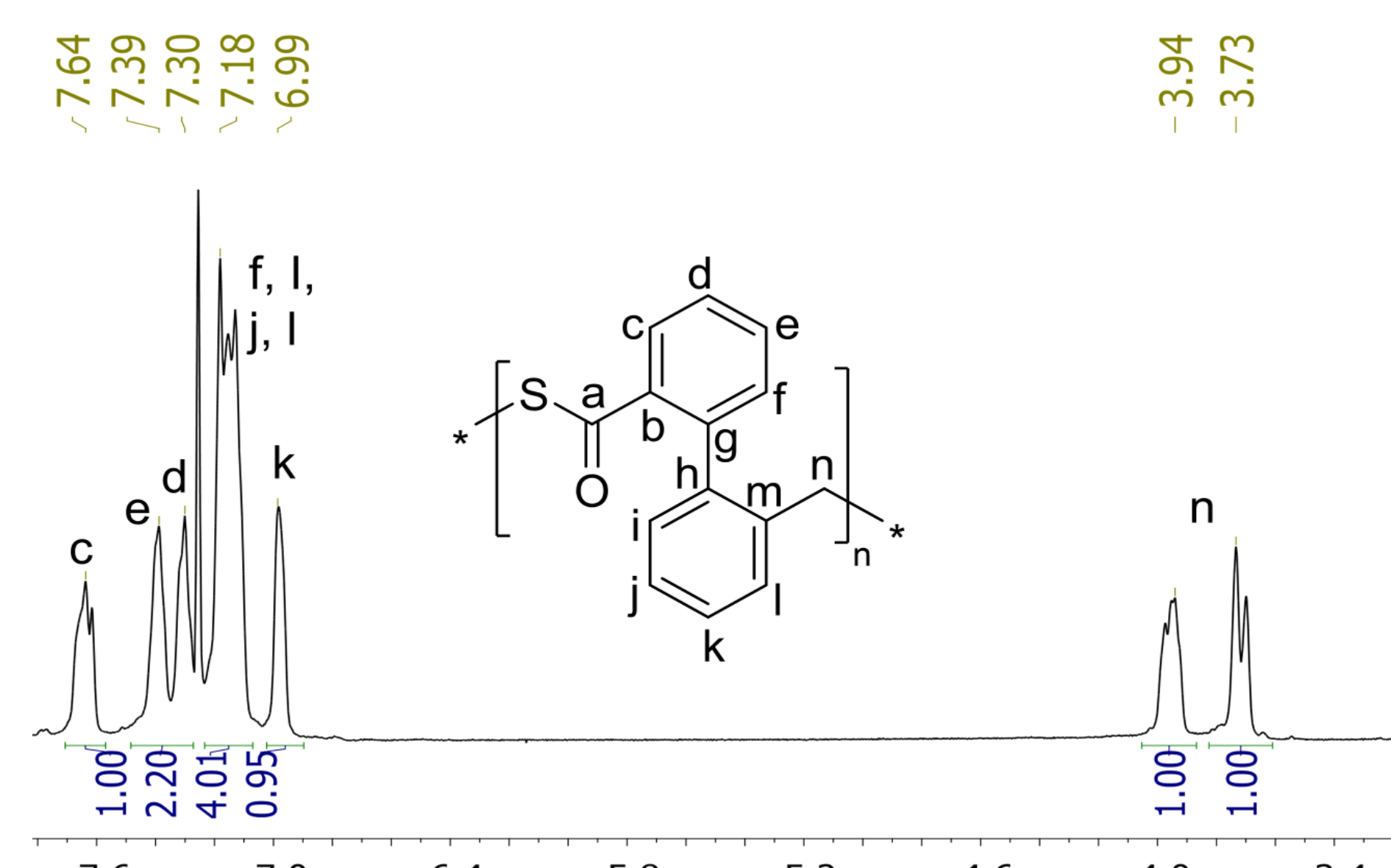
Polymerisation Experimentation



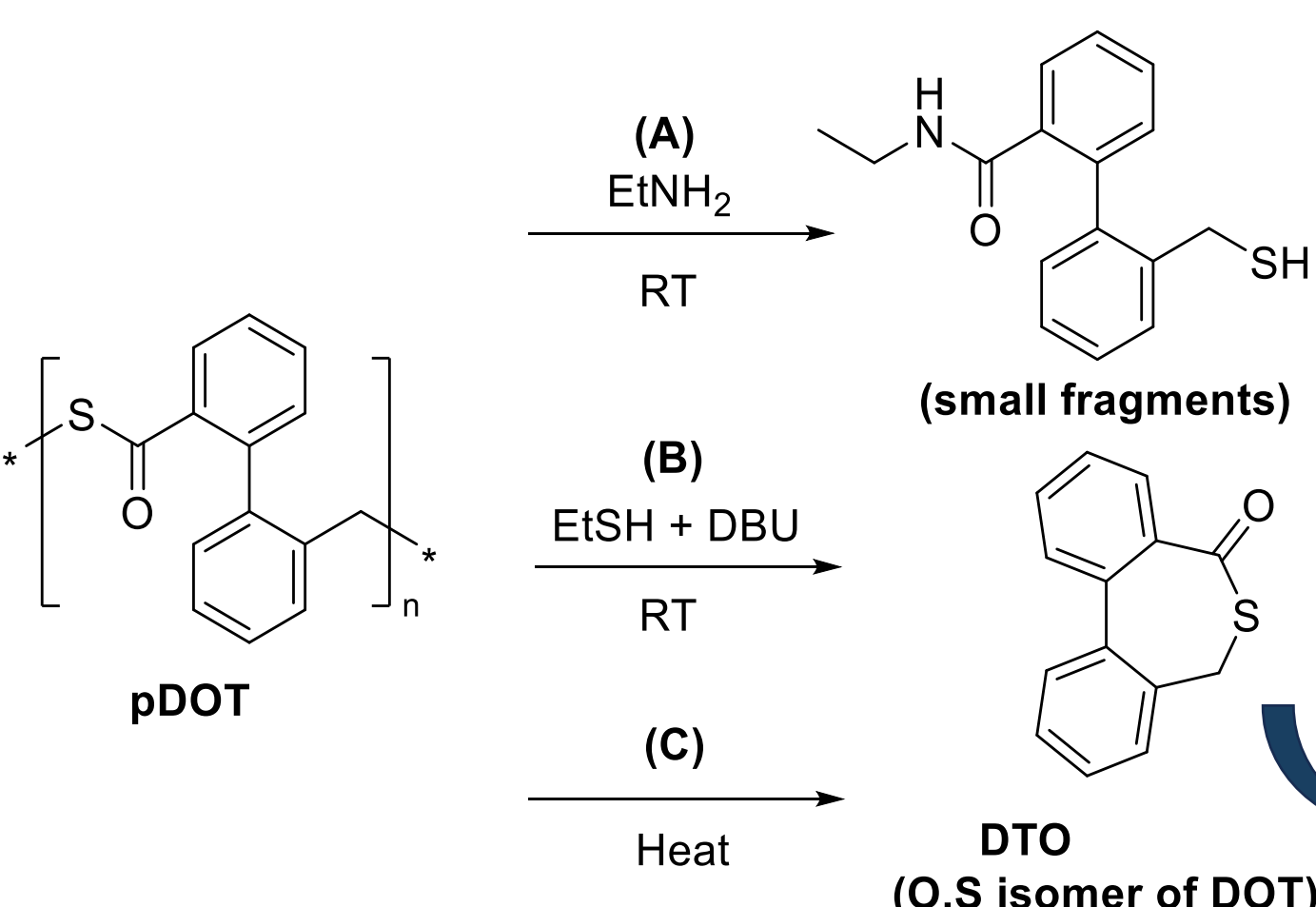
- The homopolymerisation was rapid and proceeded with **fading of the bright yellow colour of DOT**.



¹H NMR spectrum of pDOT

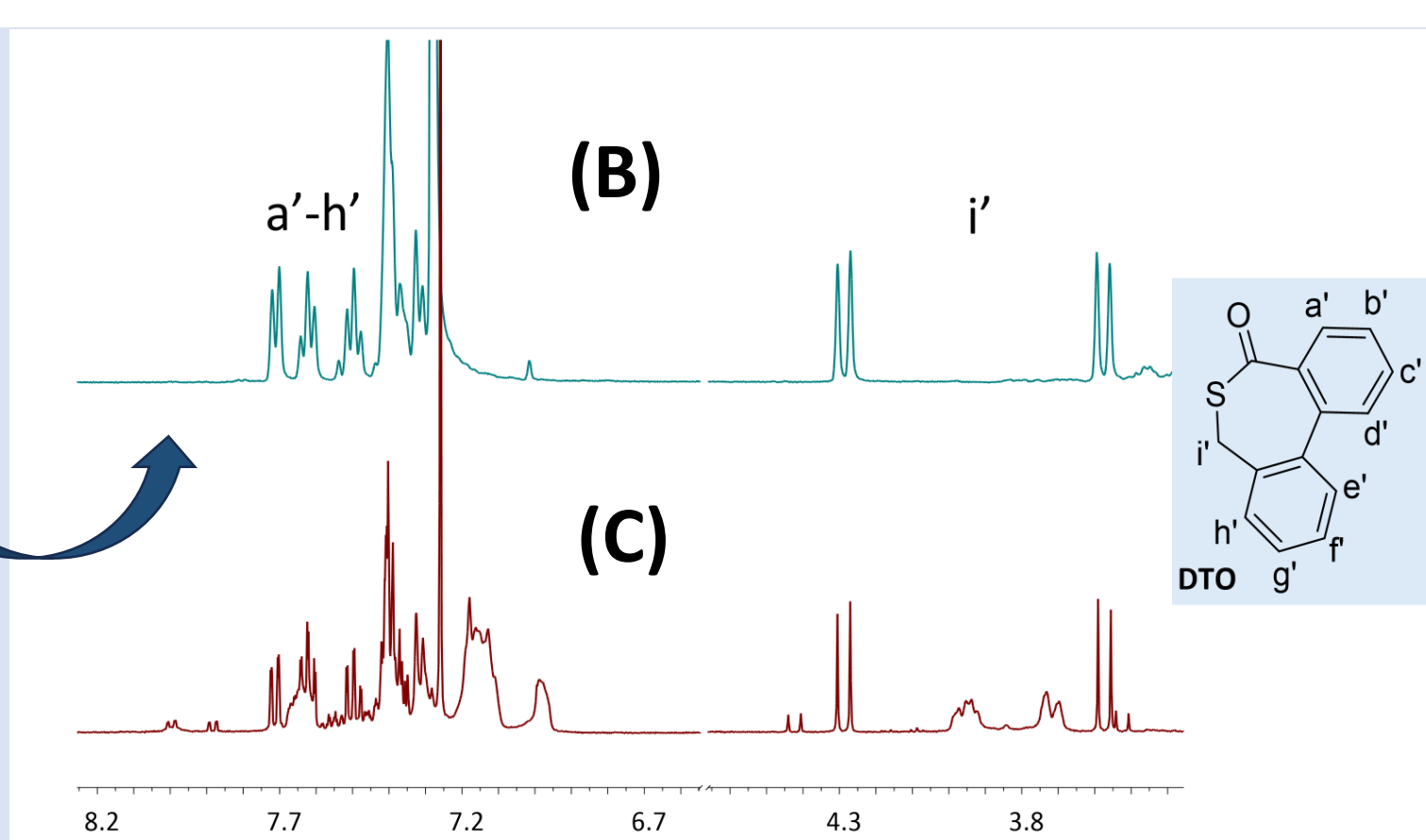


Degradation Studies

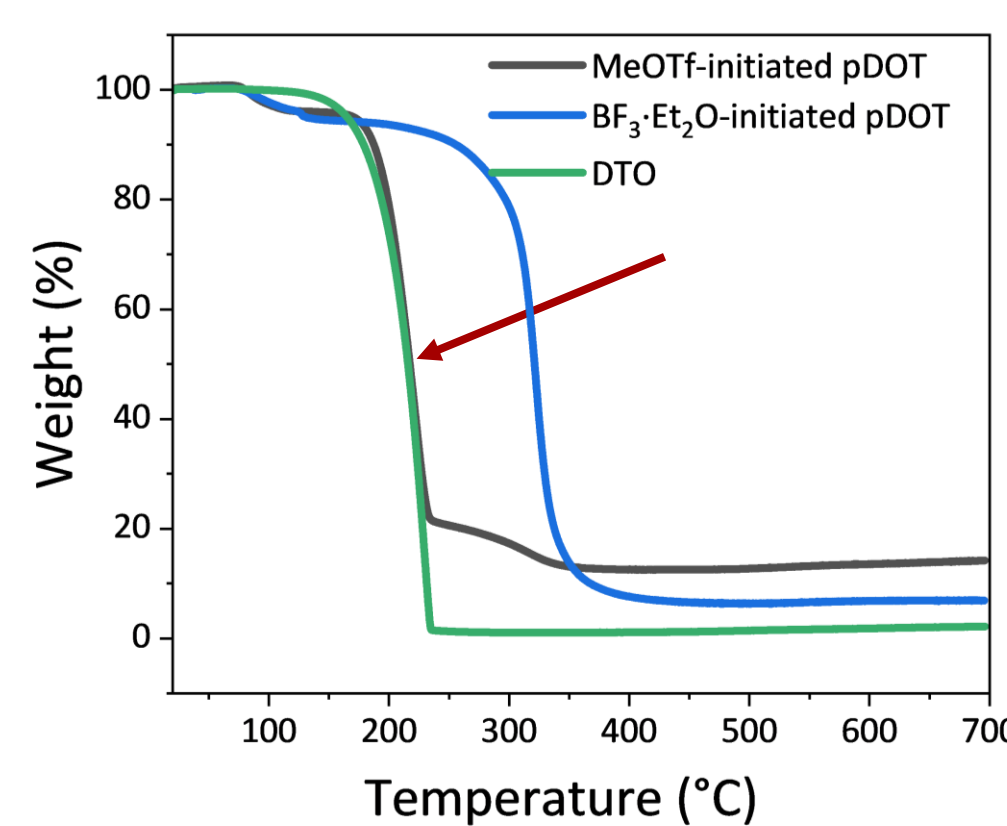
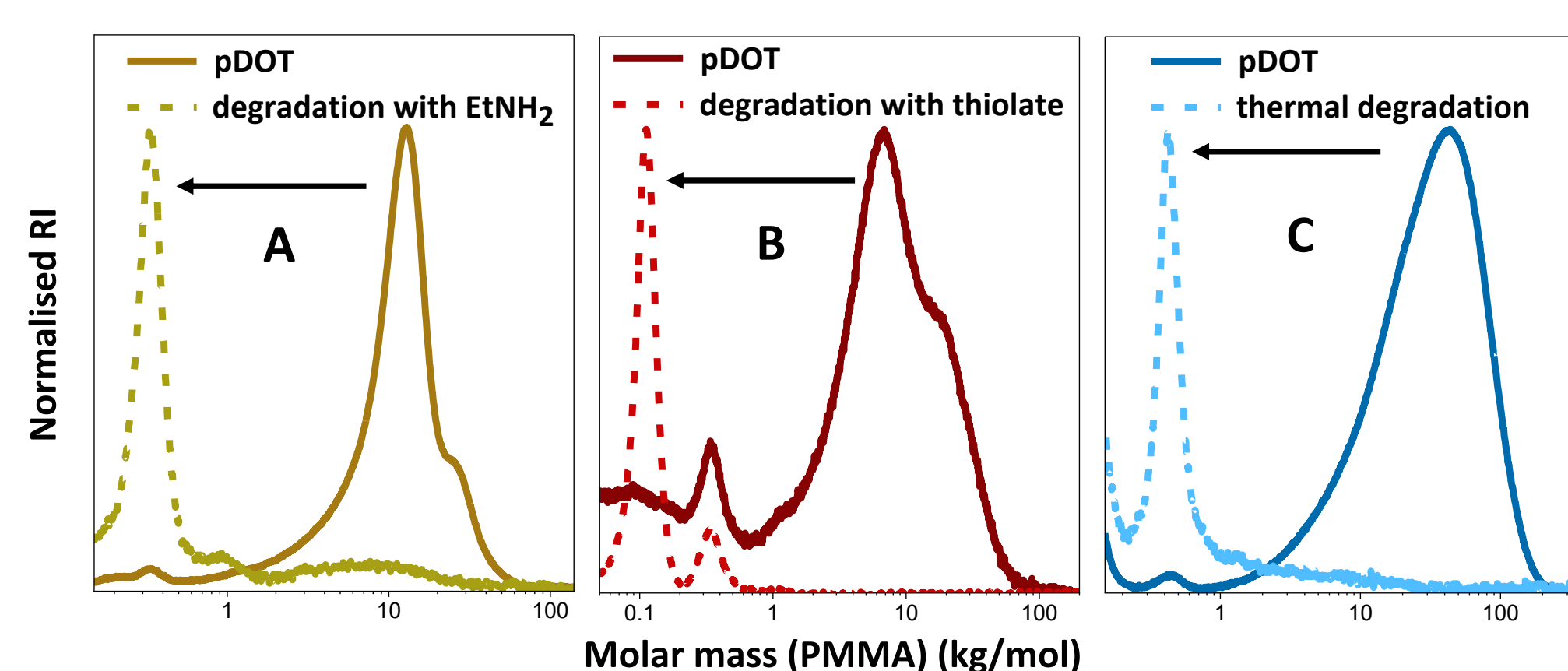


- pDOT is comprised of cleavable linkage in every repeat unit.
- The polymers were successfully degraded completely by both **aminolysis (A)** and **thiolysis (B)** at RT and also under **thermal conditions (C)** [5], [6] as found in SEC chromatogram.

¹H NMR spectra showing the formation of DTO



Pathway (B) (treatment of pDOT with excess thiolate) and **pathway (C)** (heating) cause the pDOT chains to 'unzip' and form DTO



- TGA profile of MeOTf-initiated pDOT** was like that of **DTO**.
- For thermal degradation at **140°C**, **MeOTf-initiated pDOT depolymerised** to **DTO** much **faster** as compared to **BF₃·Et₂O-initiated pDOT**.

References and Acknowledgement

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Conclusion

- Homopolymer** of DOT has been synthesized quite rapidly under ambient conditions.
- The polymers are **fully degradable** into small molecules by different degradation methods.
- The choice of **initiator** had an **influence** on the **thermal stability**.
- The formation of **DTO** from degradation of **pDOT** is a step forward towards the **recyclability** of the polymer.