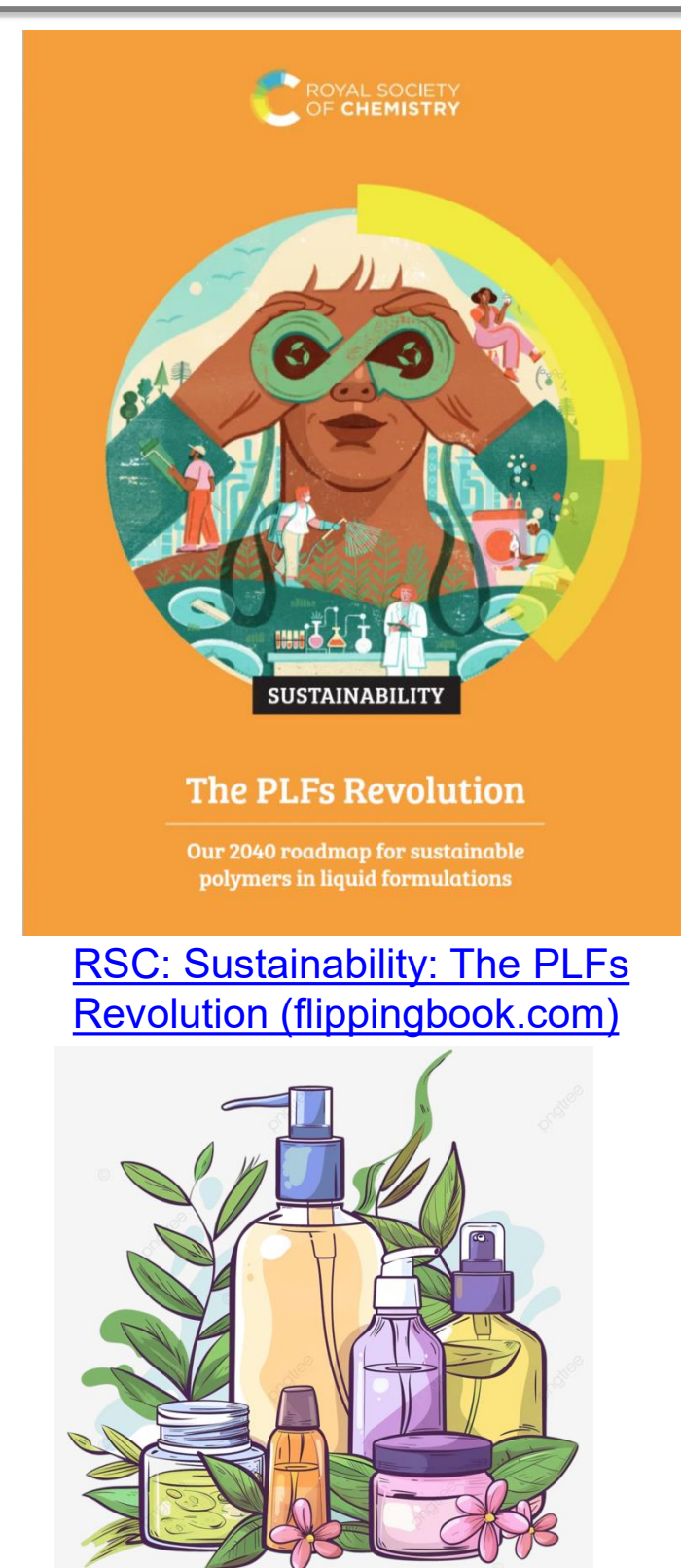


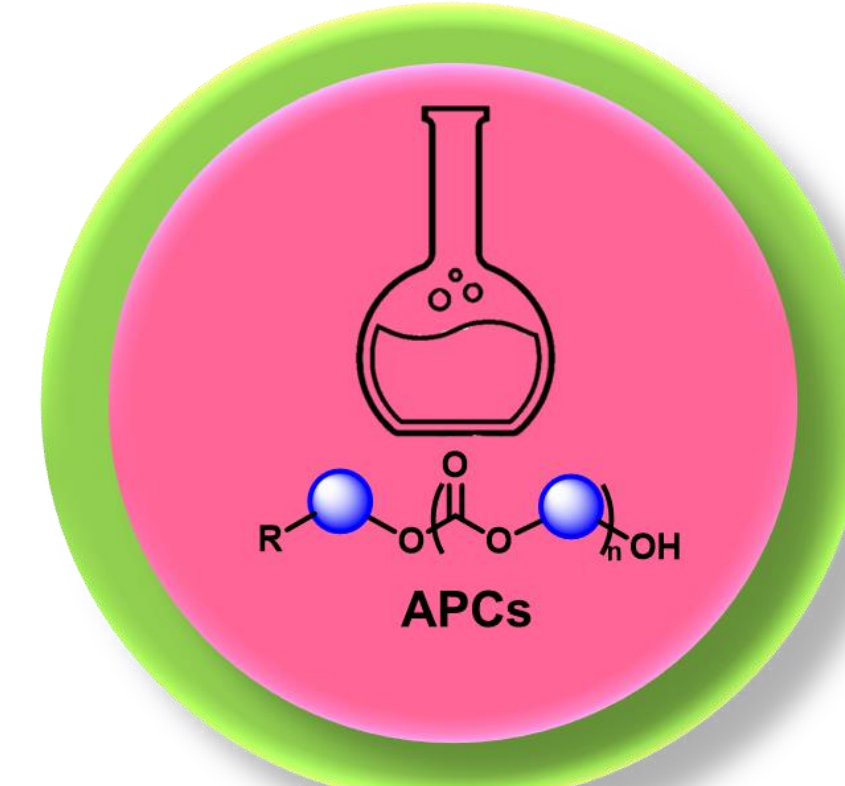
Introduction

- PLFs - key components in many consumer and industrial products.
- Estimated global PLF production: **29–36 million tonnes annually**.
- Current PLF production is unsustainable, following a **make-use-dispose** model.
- The industry depends heavily on fossil-derived feedstocks.
- Need to replace non-degradable, fossil-based polymers with truly sustainable alternatives.
- A sustainable approach requires evaluating the origin of resources, biodegradability, biocompatibility, and formulation performance.



Aim & Objectives

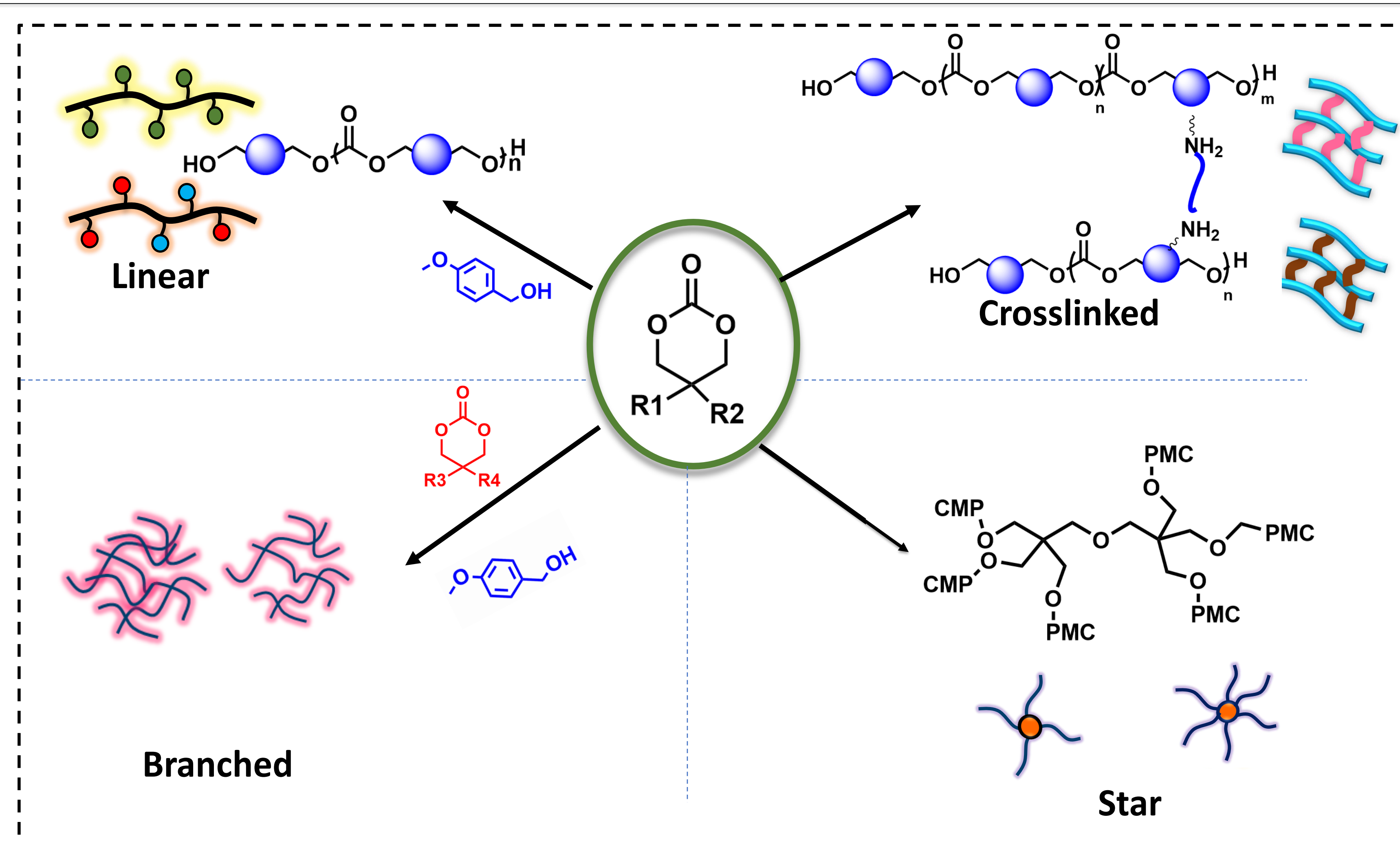
Designing sustainable water-soluble PLFs to investigate their performance in home, beauty, and personal care products.



- ✓ Versatility and mild reaction conditions
- ✓ Good control - molecular weight, dispersity, and end-group fidelity
- ✓ Post-functionalized modification

- Synthesis of water-soluble APCs
- Study the thickening effect of APCs in personal care products

Designing the library of Aliphatic Polycarbonates



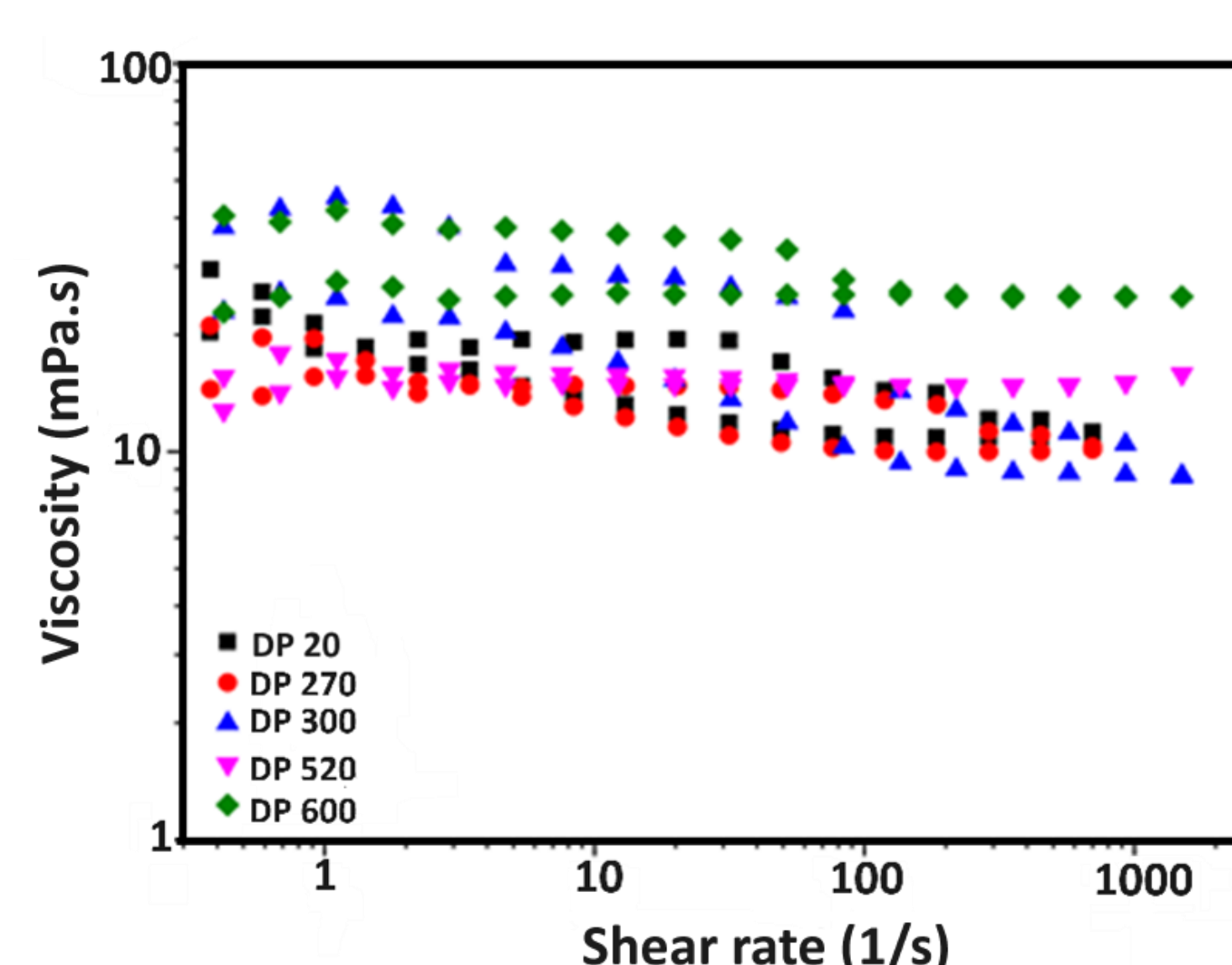
- **Linear APCs**- Varying degrees of polymerization (DP 20, 50, 100, 600) - impact of molecular weight and polymer wt%, on thickening efficiency

- **Branched APCs**- Varying ratios of inimer and initiator: effect of degree of branching and molecular weight

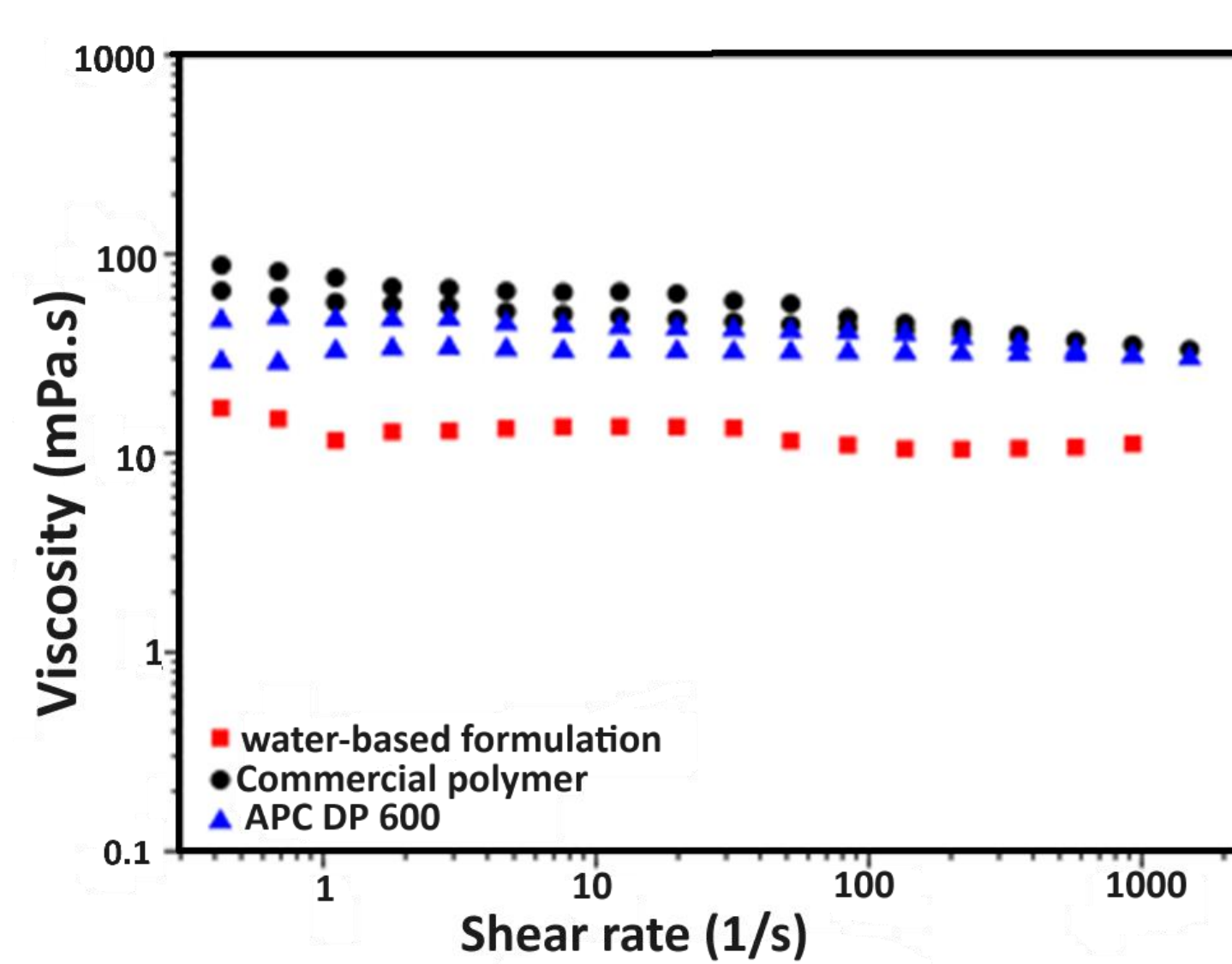
- **Crosslinked APCs**- Crosslinker type, crosslinking density, and backbone chain length- effect on thickening in water-based formulations

- **Star APCs**- Molecular weight (via different DPs) and number of arms - influence the thickening performance of formulations

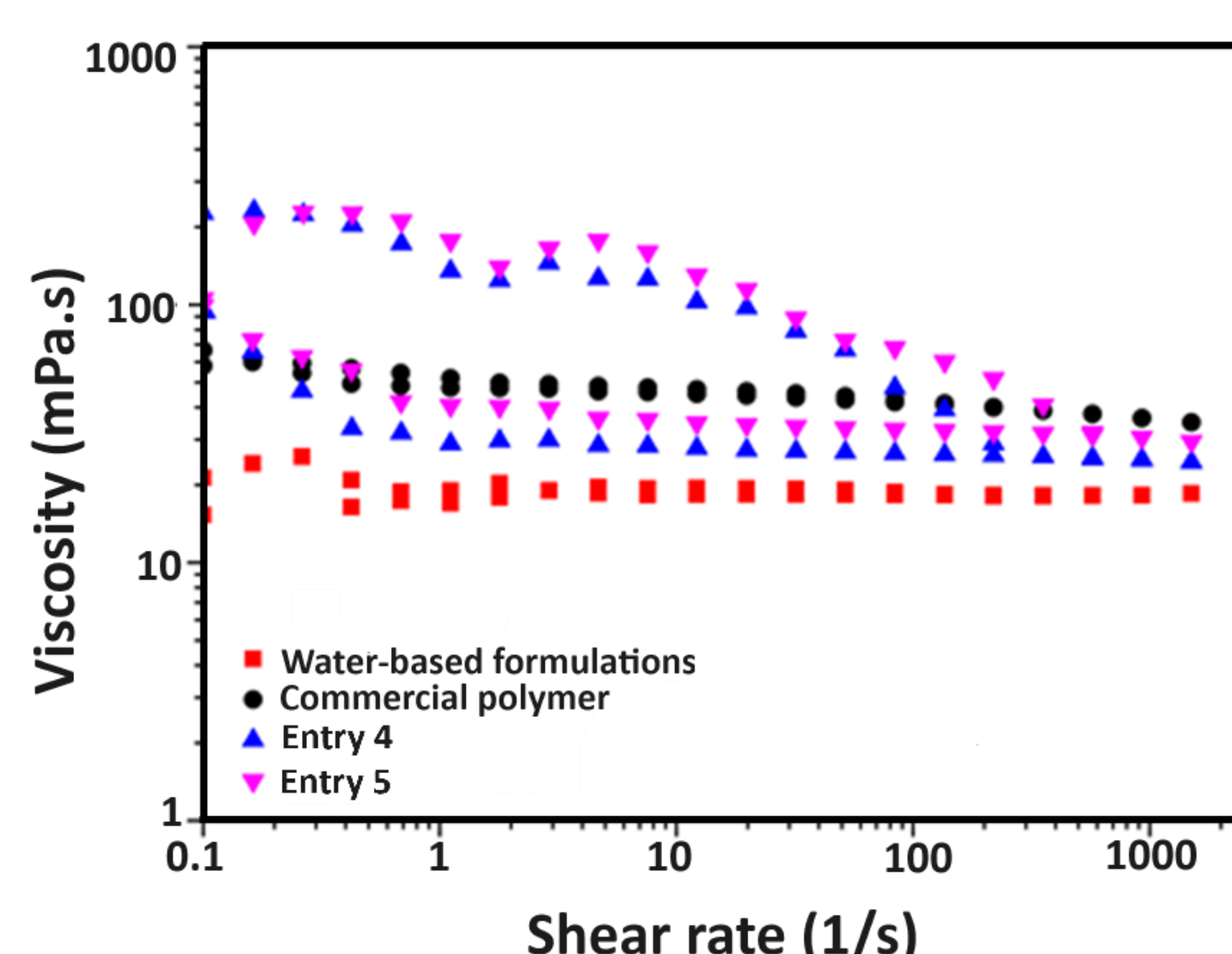
APCs in liquid formulations as viscosity adjusters



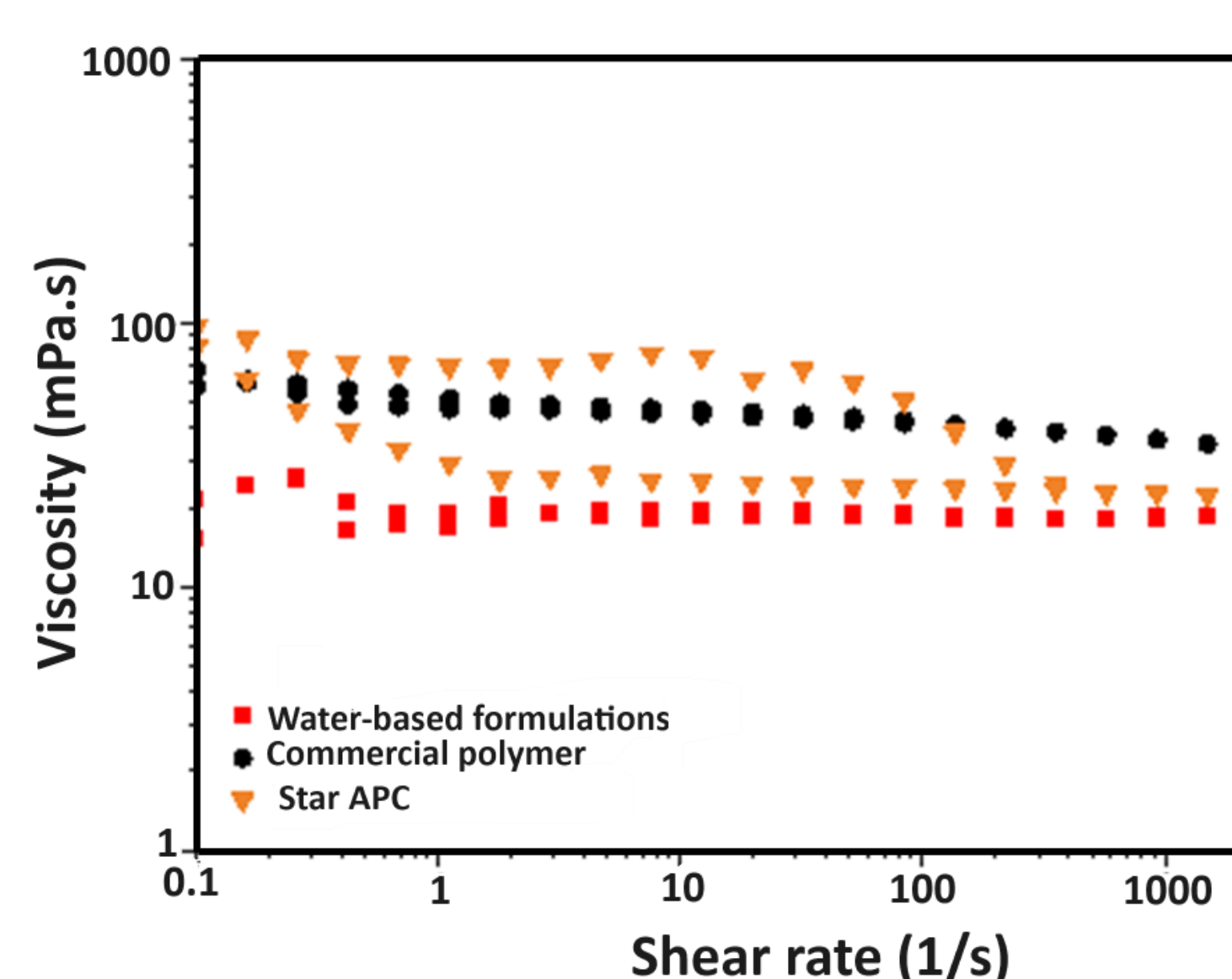
- High molecular - higher thickening effect



- DP 600 APC - thickening close to commercial polymer

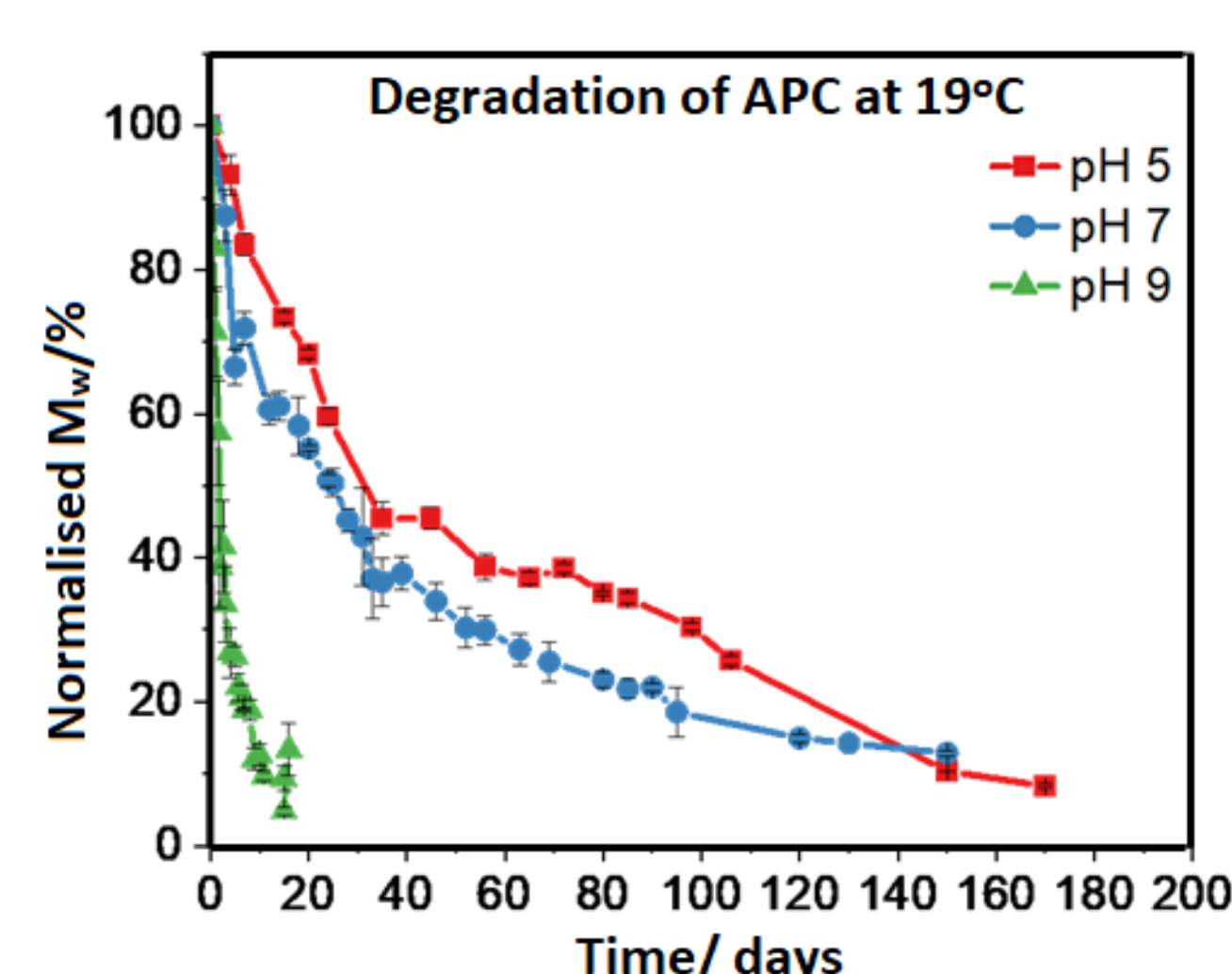


- APCs with different level of branching - different impact on thickening, some better than commercial polymers



- star APCs - thickening comparable to commercial polymer at low shear, drop off at higher shear rates

Hydrolytic degradation of PLFs



- Undergo hydrolytic degradation
- Degrade faster in a basic environment

Conclusions & Future Outlook

- A series of **novel water-soluble functional APCs** with a wide range of molecular weights and architectures.
- These APCs/PLFs showed a **potential thickening effect** in water-based formulations, and some were comparable to commercial PLFs.
- Gain a deeper understanding to control their performance and degradability.
- Use of synthesized APCs as additives in beauty and personal care products.

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Presentation - Wednesday, Jun 25, 2025, 10:15 AM - 12:00 PM
Title: Designing water-soluble aliphatic polycarbonates for consumer product applications