

Sustainable Commercial Polyurethane Foam Depolymerization via Reactive Melt Extrusion Decrosslinking



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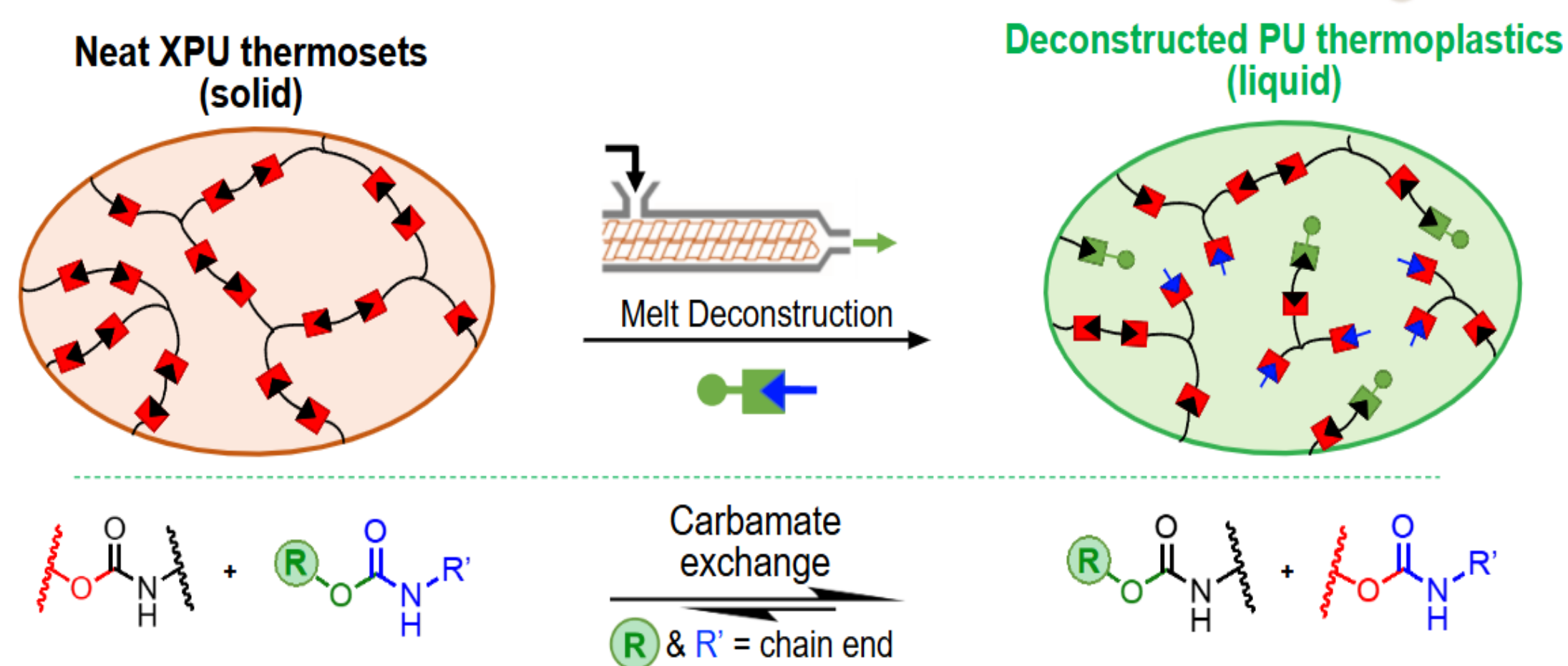
Introduction

Is there a solvent-free approach to decrosslink thermoset polyurethane foams (PUFs) into recyclable thermoplastics?

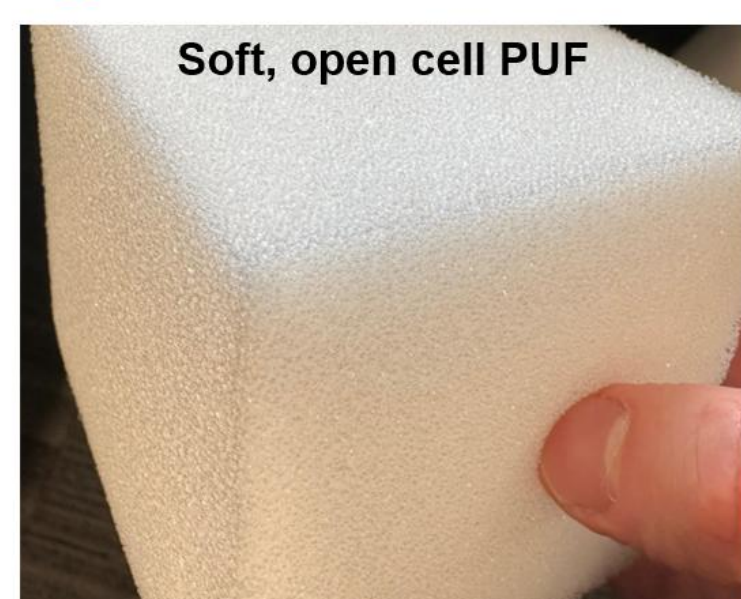
Motivation

- PUFs are complex thermoset plastics
- Current PUF recycling rates < 6%
- Solvent-free approach is sustainable
- Transformed PUFs used as industrial adhesives

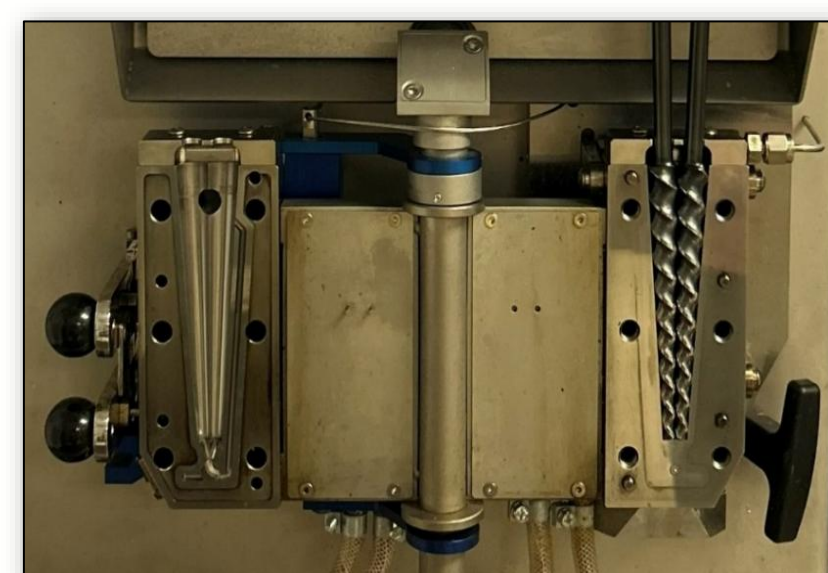
Reactive Melt Extrusion Deconstruction (RMED)



CARPENTER



Twin screw extruder



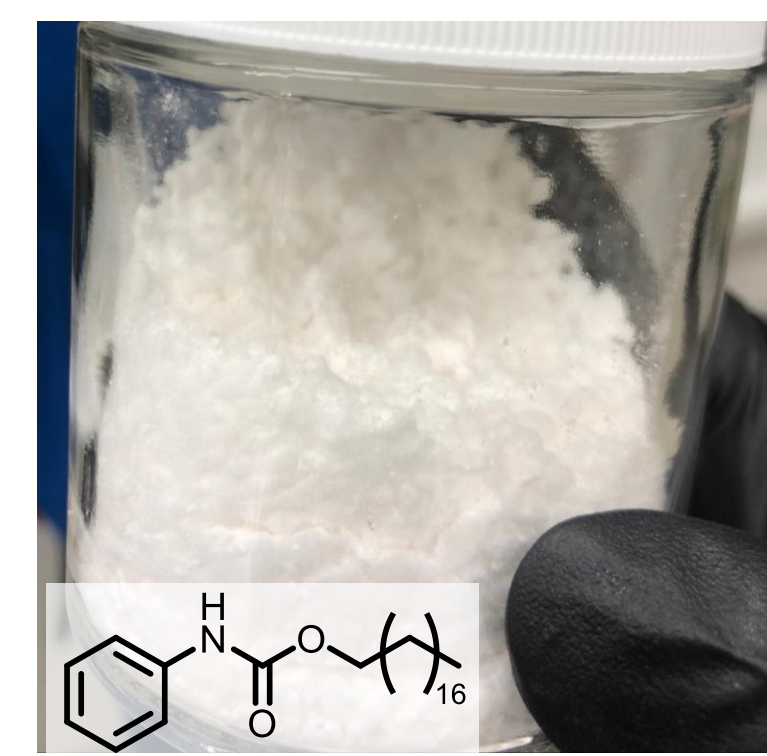
Methodology

Carpenter PUF



+

Model decrosslinker



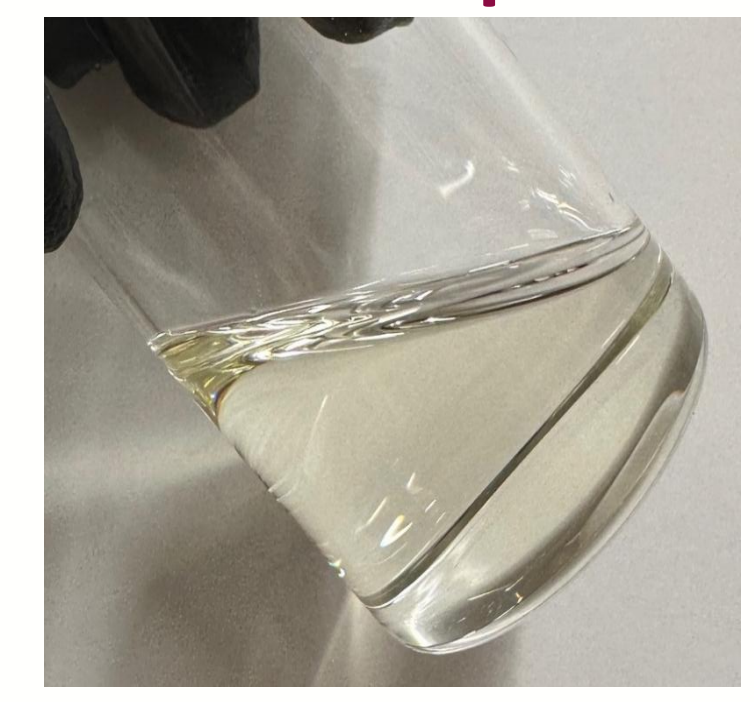
RMED
 DBTDL
 195 °C,
 150 rpm,
 8 min

Deconstructed commercial PUF



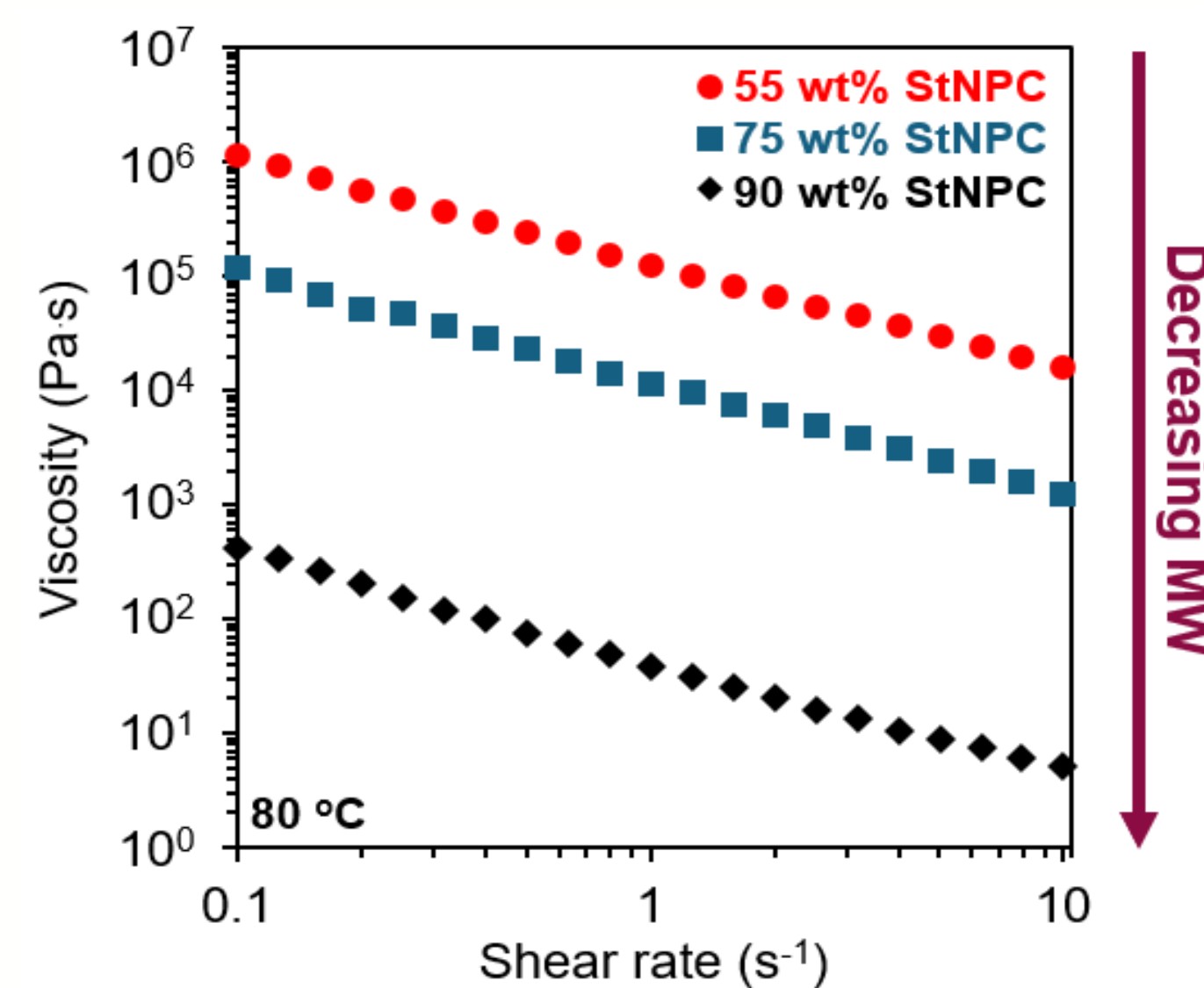
DMF

Solvent-soluble PU thermoplastic



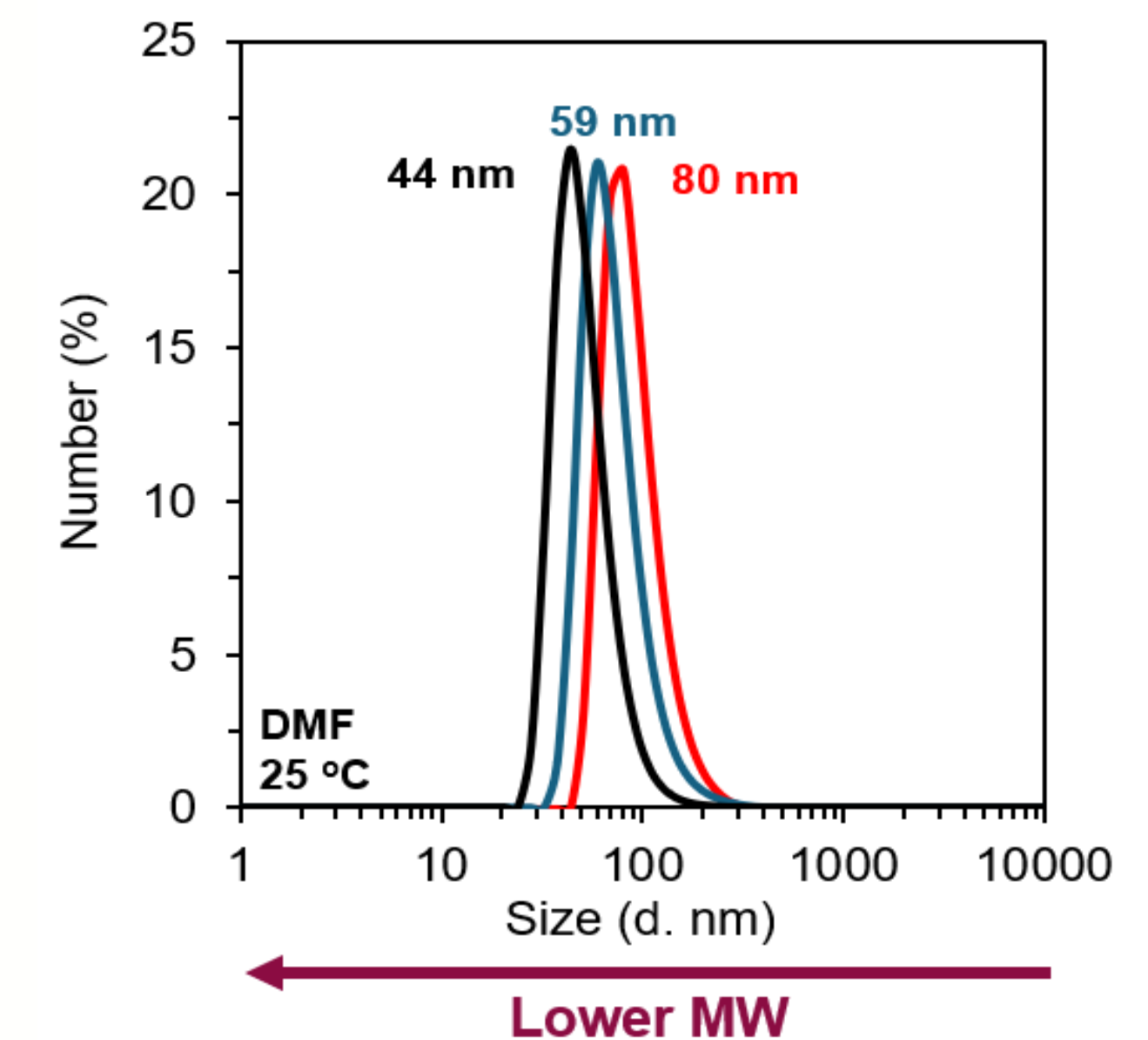
Findings

Melt rheology



- Lower viscosity as shear increased
- Suggests lower polymer chain length

Dynamic light scattering (DLS)



- Particle size shifts as DX % increased
- Suggests smaller particles or shorter chains

Findings qualitatively suggests decrosslinked PUFs