

Catalysis in Poly(hydroxy-urethane) Systems: Rheo-polymerization Testing

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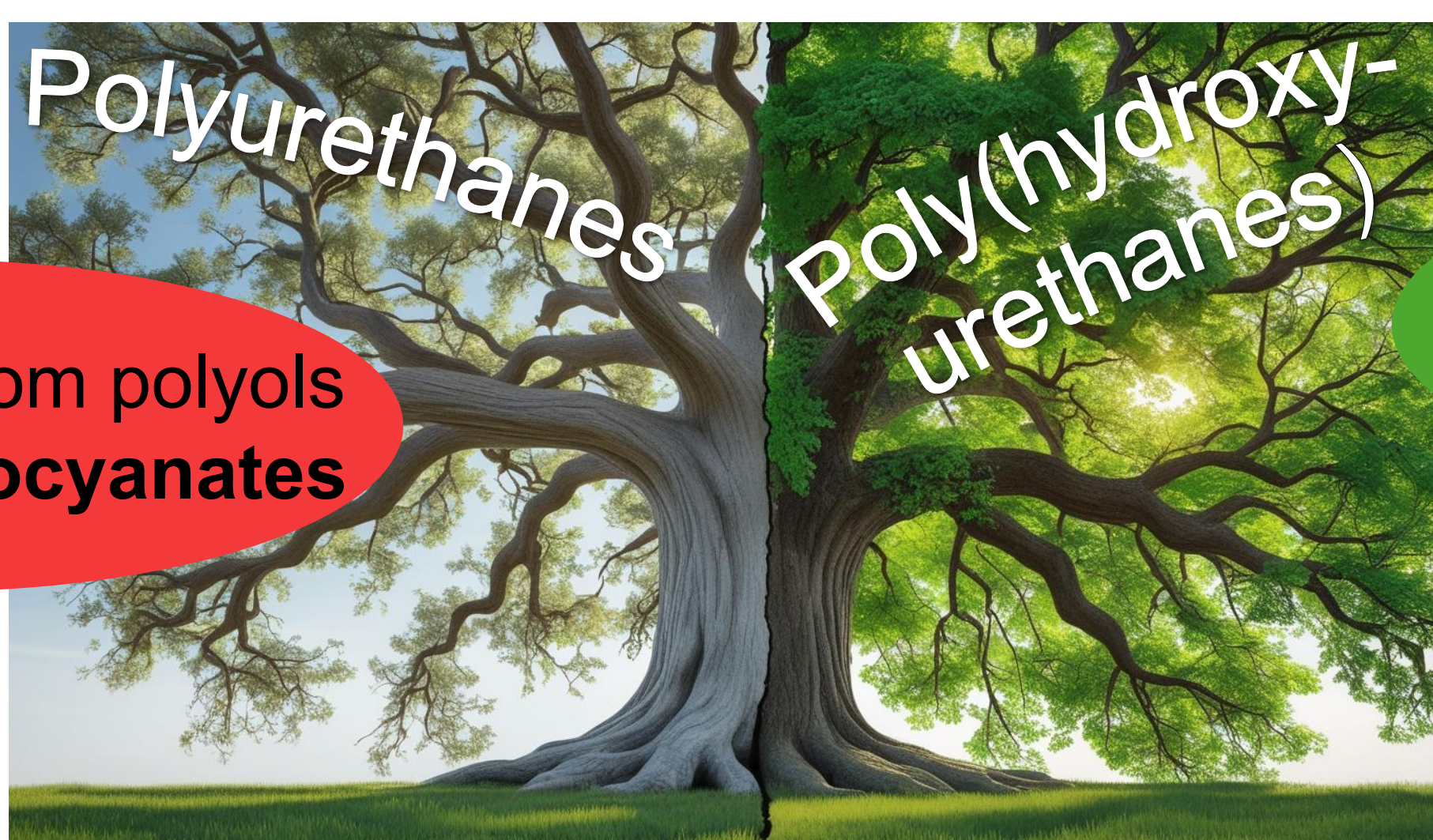
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6th most produced polymer
globally
with versatile applications

Synthesized from polyols
and **toxic diisocyanates**

A technology with
decades of industrial use

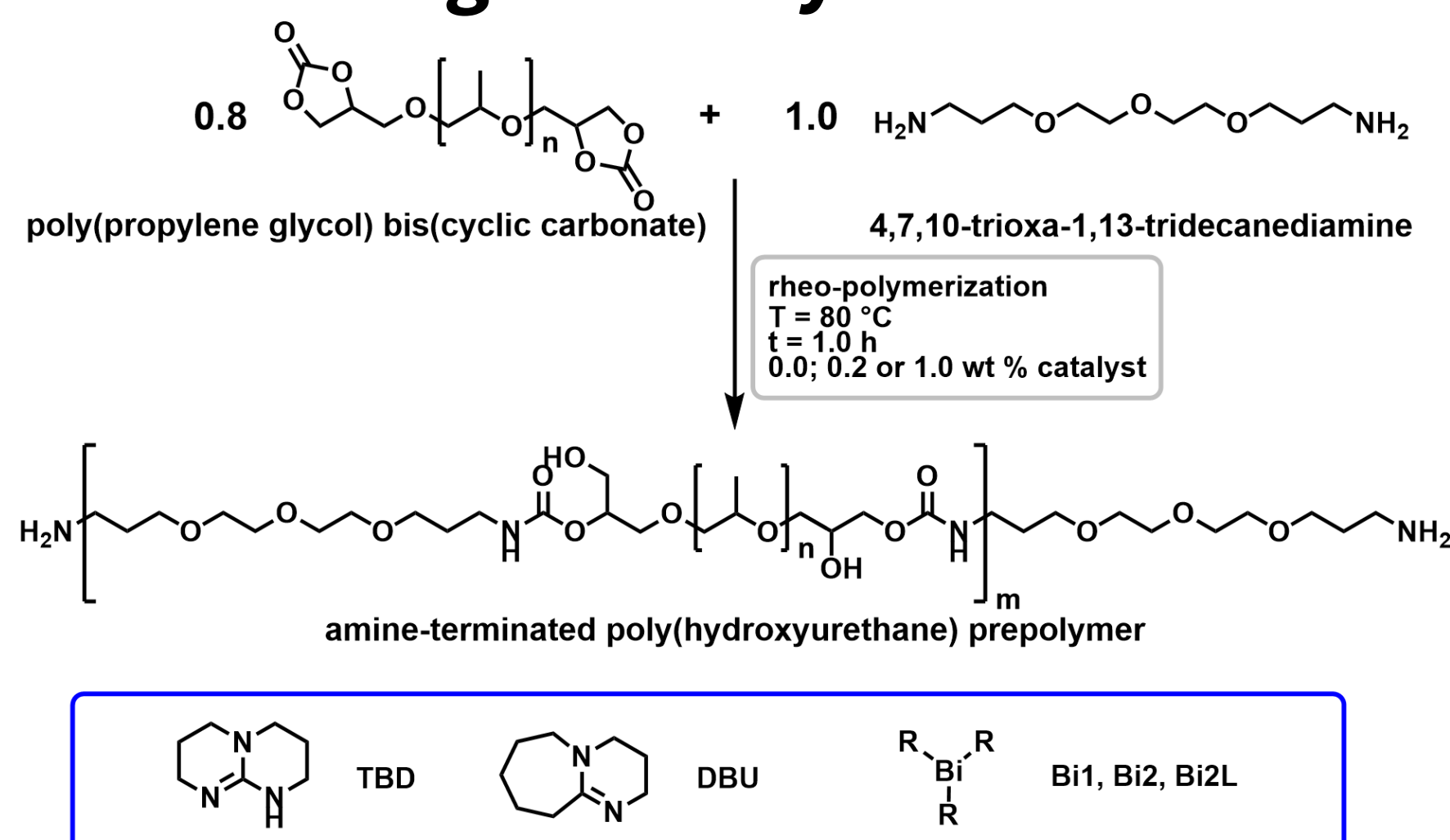


Alternative for
polyurethanes

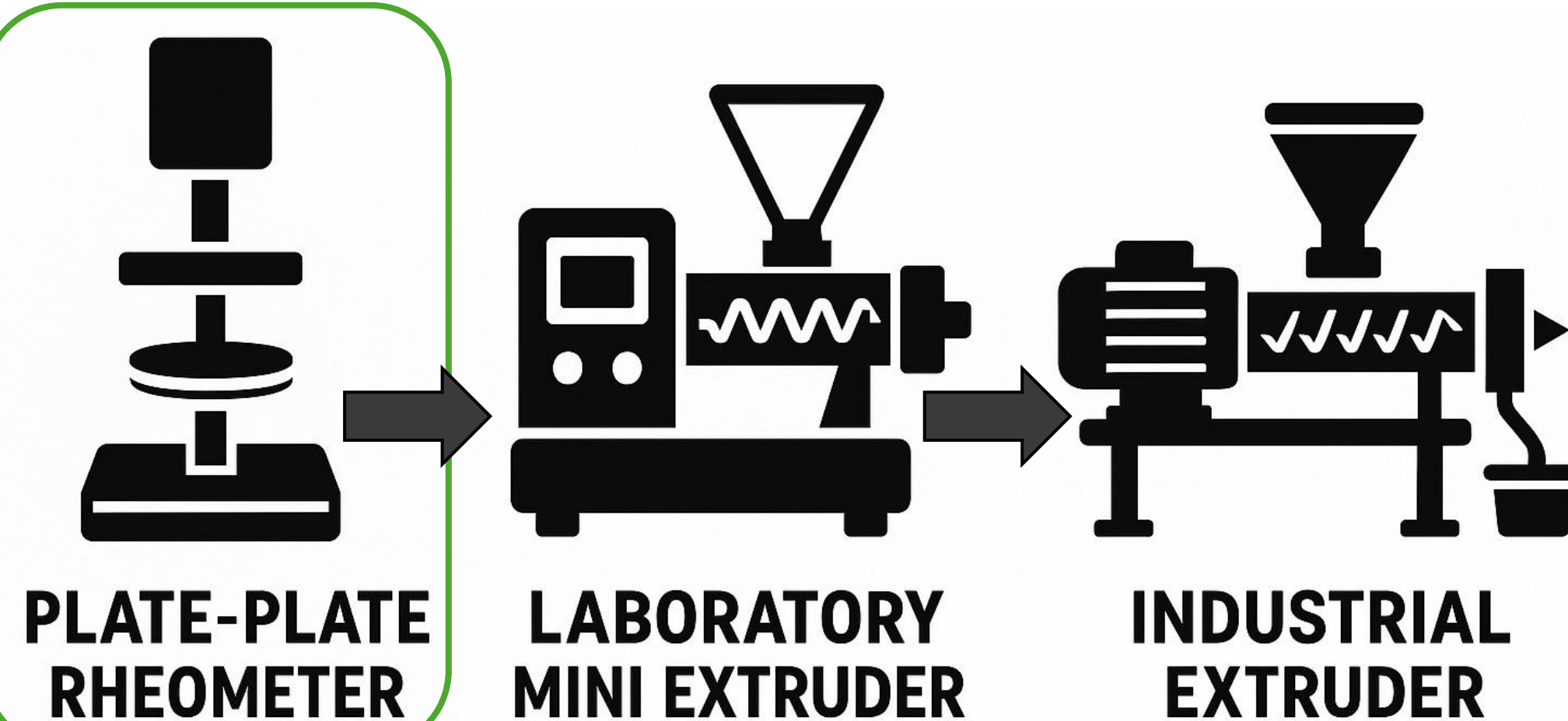
Synthesized from
diamines and CO₂-based
cyclic carbonates

A novel solution - requires
further **investigation**
and **optimization**

Testing of catalysts for PHUs



Primarily step before up-scaling



Methodology

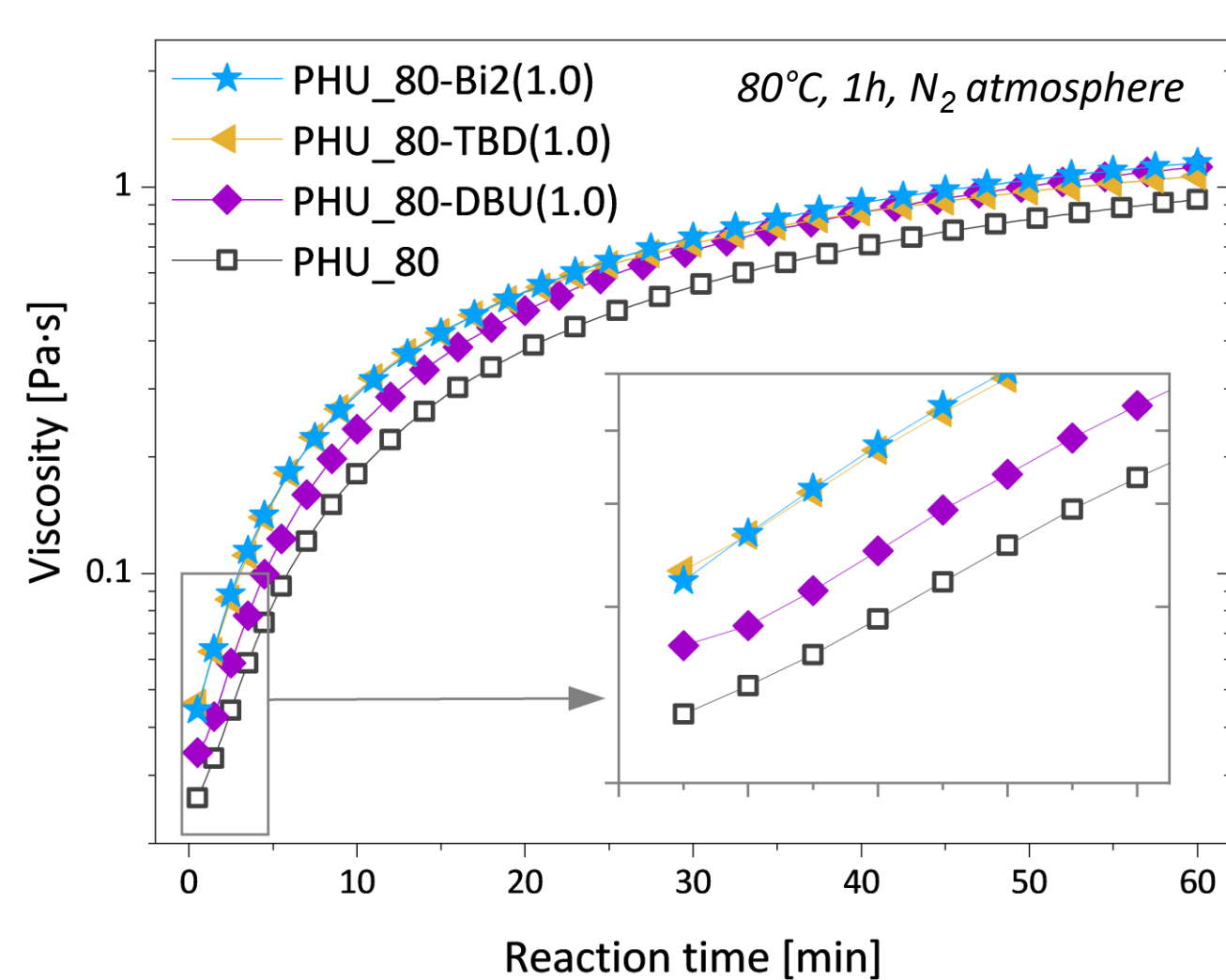


Figure 1. Rheo-polymerization, 1h, 80°C

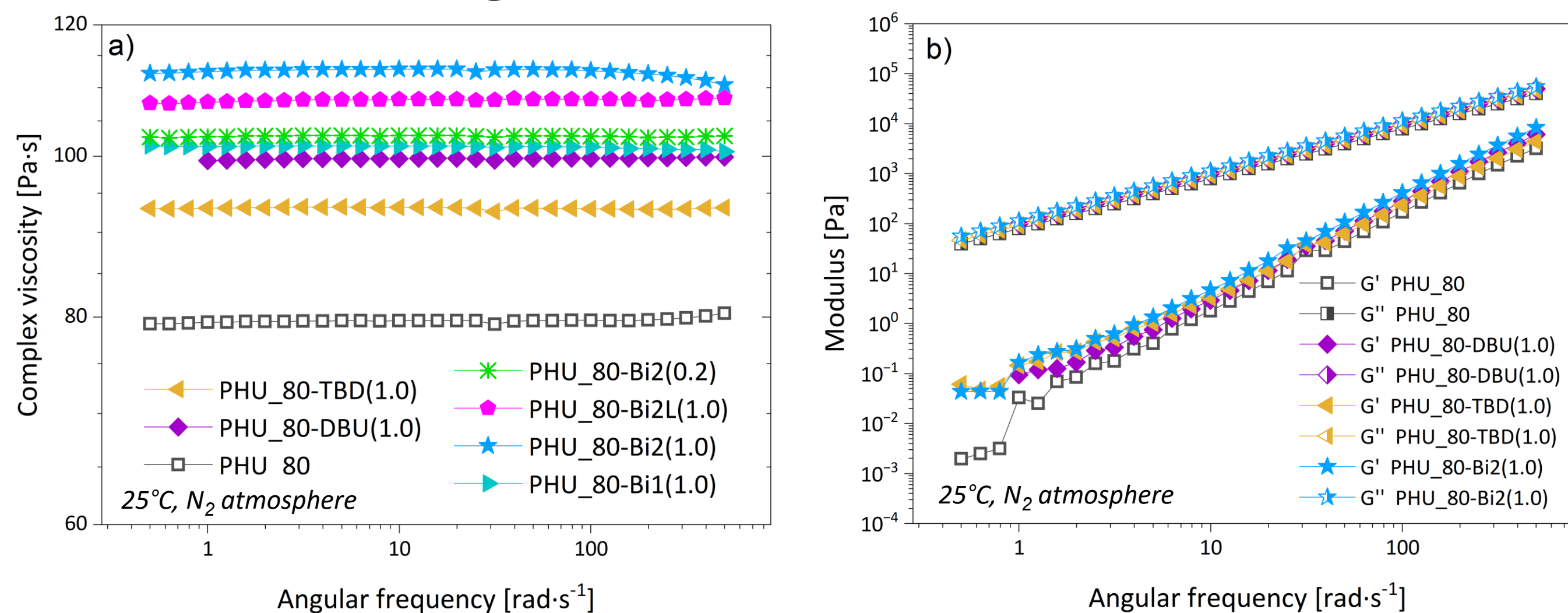


Figure 2. Comparison of differences in performance of catalysts based on frequency sweep measurements at 25°C: a) complex viscosity, b) moduli

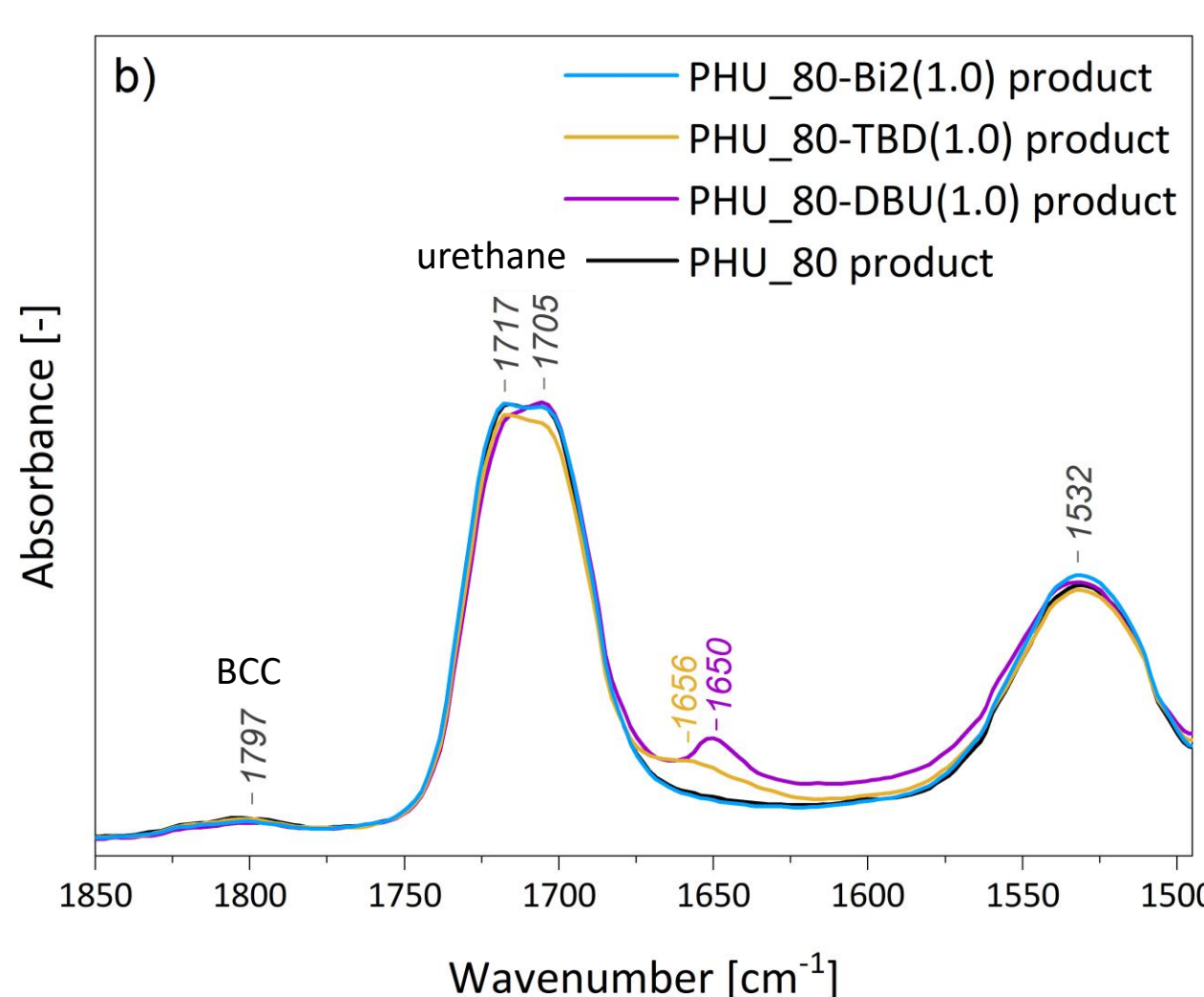
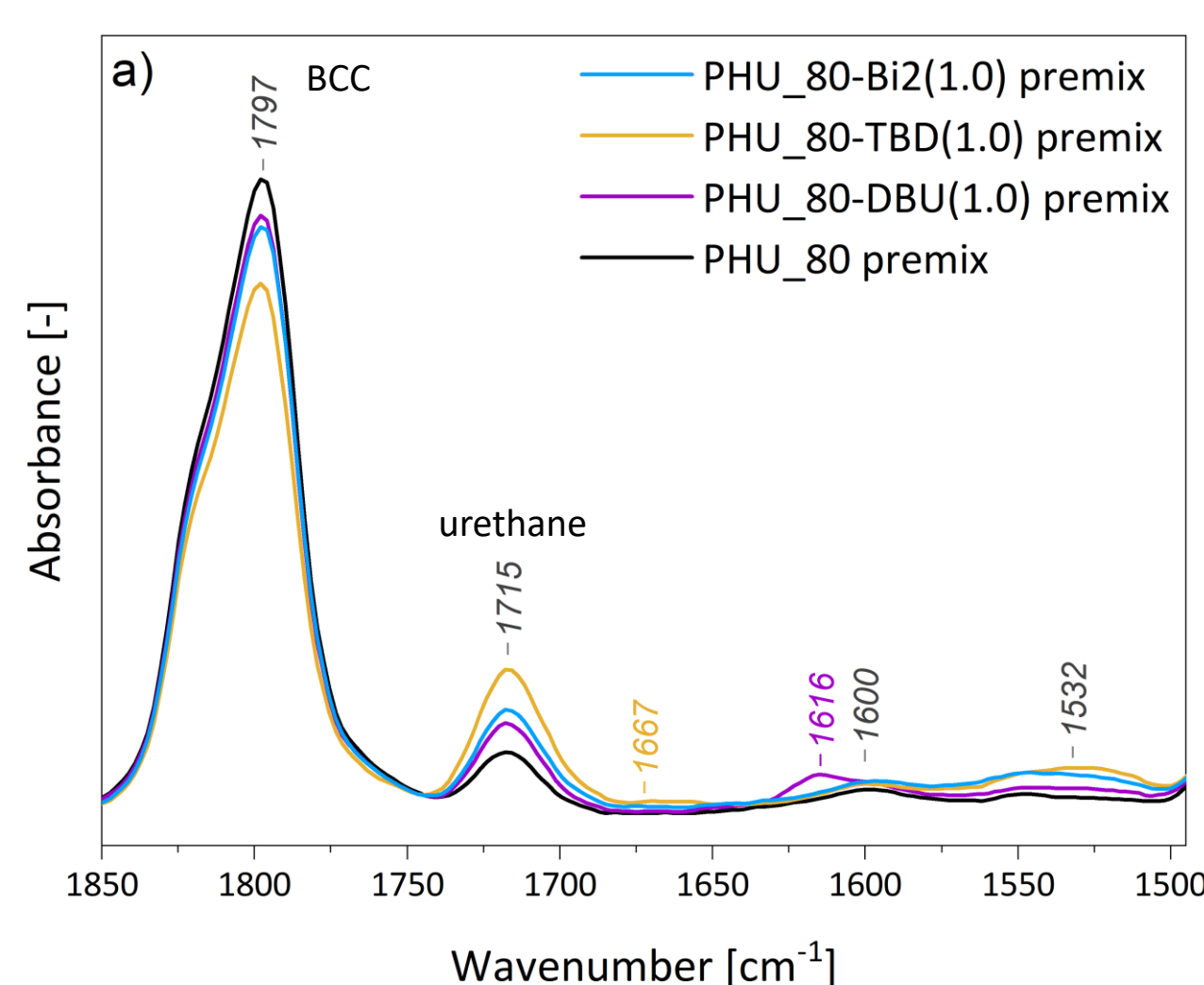


Figure 3: FT-MIR spectra of: a) premixes prior to rheo-polymerization, b) products.

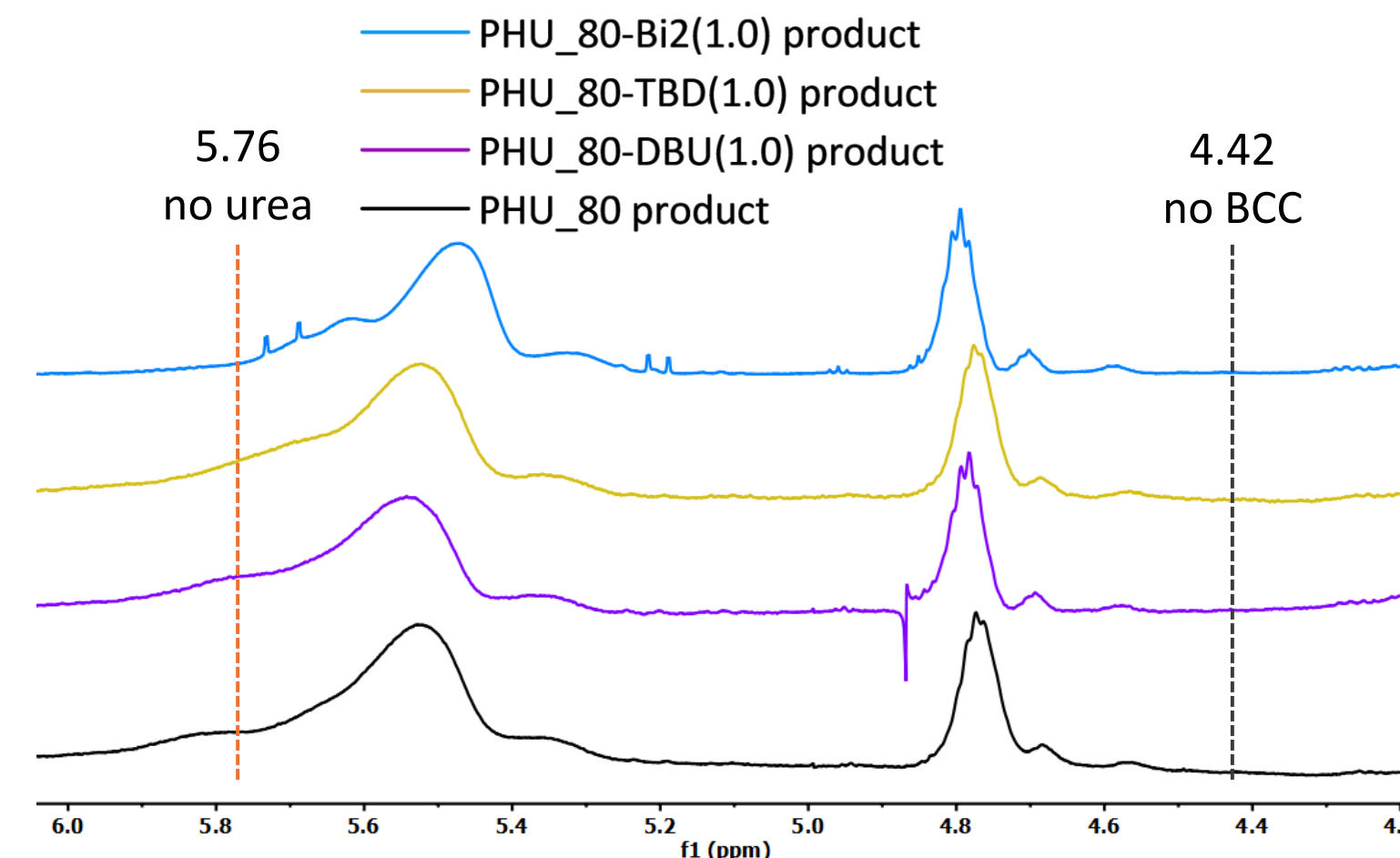


Figure 4: ¹H NMR spectra of products

Conclusions

Rheo-polymerization:

- Efficient approach for screening polymerization conditions with various formulations of monomers and catalysts

Post-polymerization:

- 1h of rheo-polymerization is insufficient to reach full conversion (BCC residuals in FT-MIR of products),
- Full consumption of BCC in ¹H NMR conducted after storing,
- Oscillatory rheological measurements performed immediately after synthesis as a reliable analytical method

Low-viscosity system:

- Ideal coating precursor providing uniform coverage, after siloxane modification enabling moisture curing

Bi-based catalysts vs amine-based catalysts:

- Comparable performance, even at lower concentrations,
- Lower toxicity and greater stability under reaction condition

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