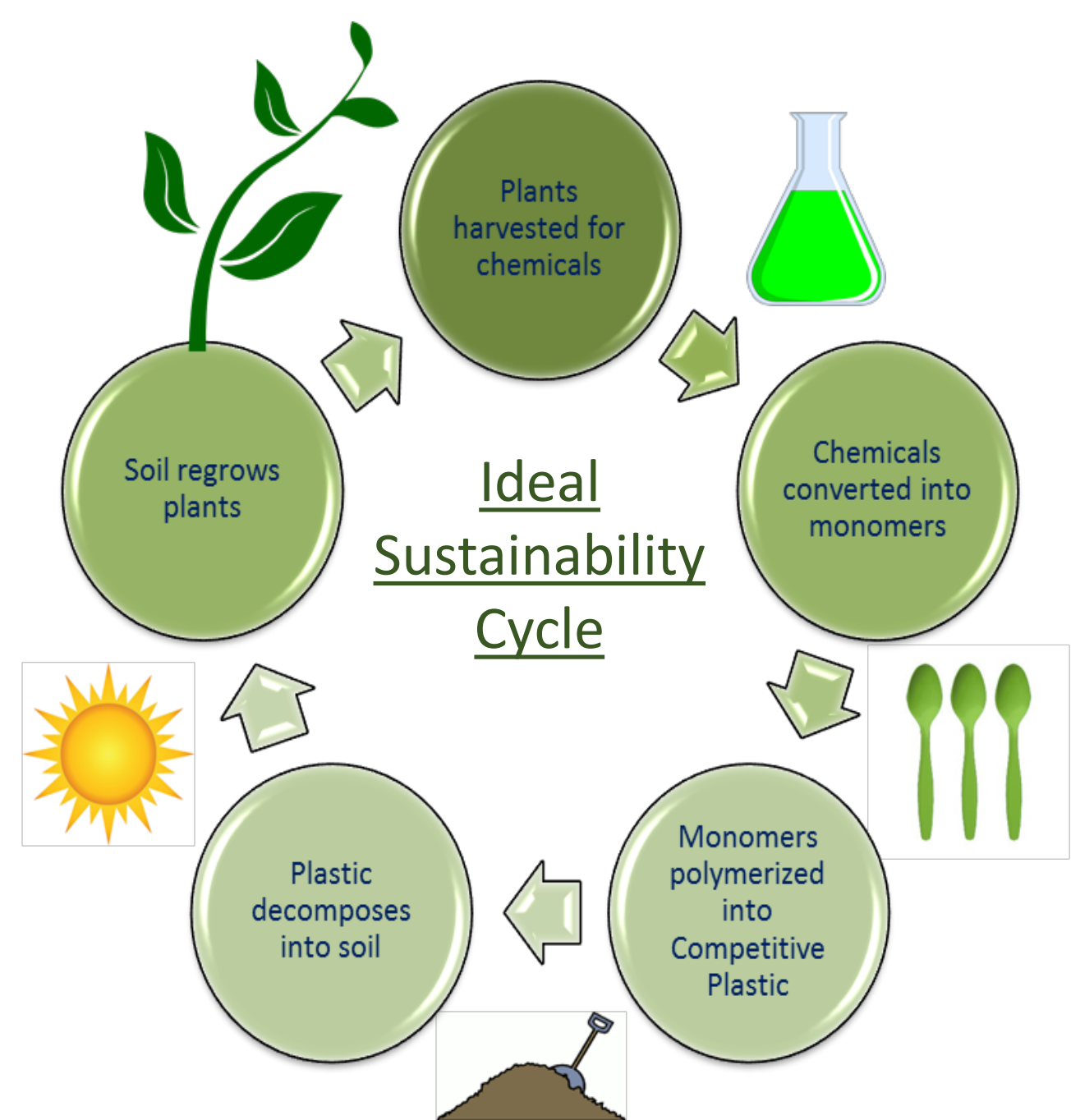


Sustainable Polymers from Renewable Biomass

Why are we doing this?

Nearly all commodity plastics are made from petroleum and, under average oceanic conditions, will persist for hundreds of years. Our goal is to design and synthesize new competitive plastics from chemical precursors derived from globally available biomass waste and optimize their degradability based on the purpose of the plastic.



An estimated **11 billion pounds** of plastic reach the open ocean each year.

Miller, S. A. *ACS Macro Lett.* **2013**, 2, 550-554

In 2013, 107.5 billion pounds of plastic resin was generated...in the U.S. alone!

~44% containers & packaging

~34% durable products (cars, appliances)

~22% non-durable good (single use items)

Less than 10% of plastic waste is recycled

SOURCE: EPA & American Chemistry Council
www.epa.gov www.americanchemistry.com

How to learn more.



more information on:
 -research
 -facilities
 -members
 -outreach



website: www.chem.fsu.edu/~kennemur

Dr. Justin G. Kennemur

[@KennemurFSU](https://twitter.com/KennemurFSU)

Funding:




Collaborations:





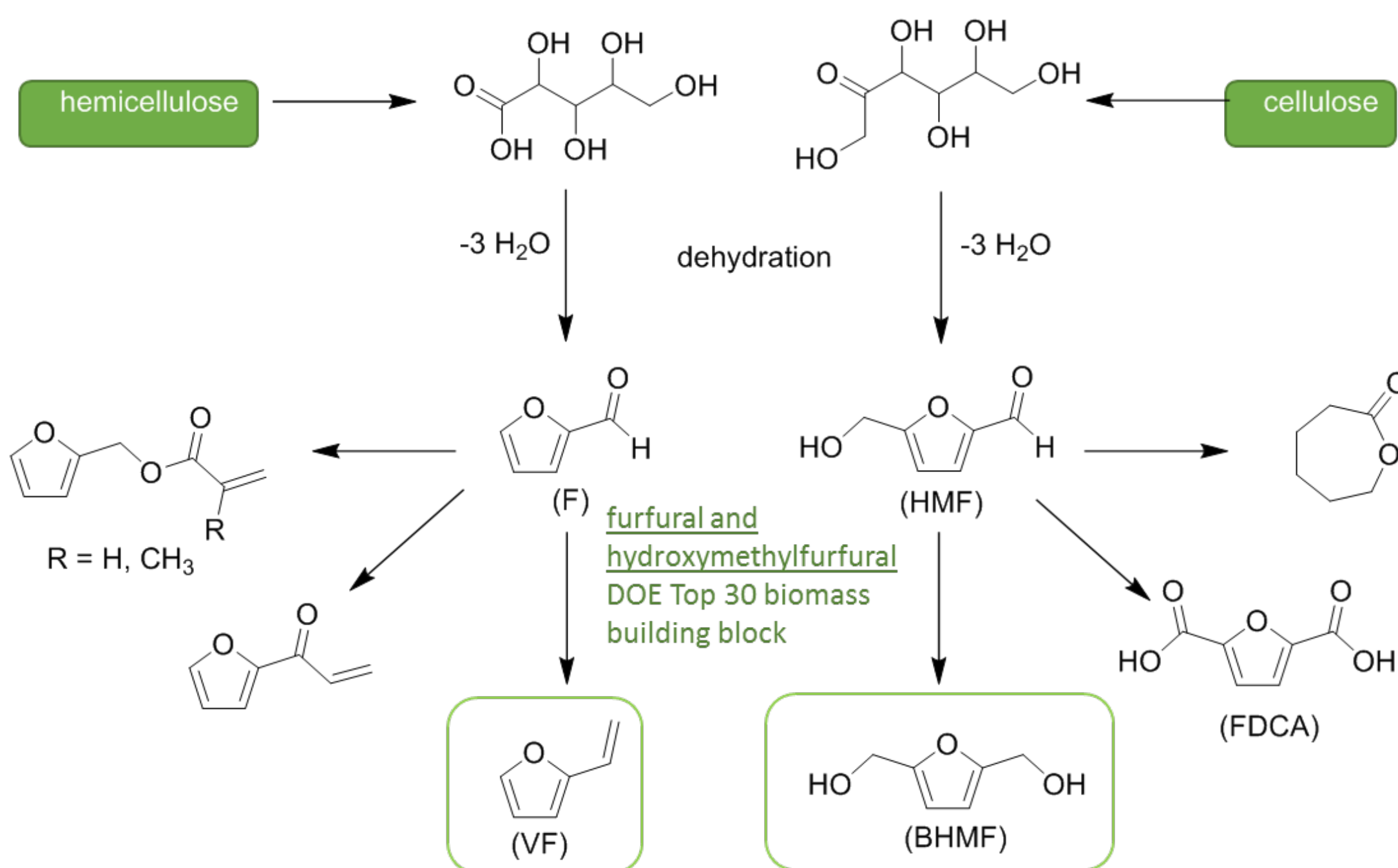


How are we doing this? polymer chemistry

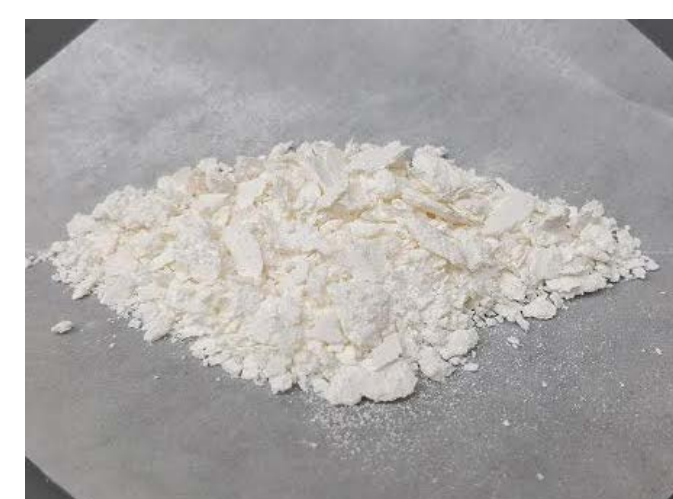
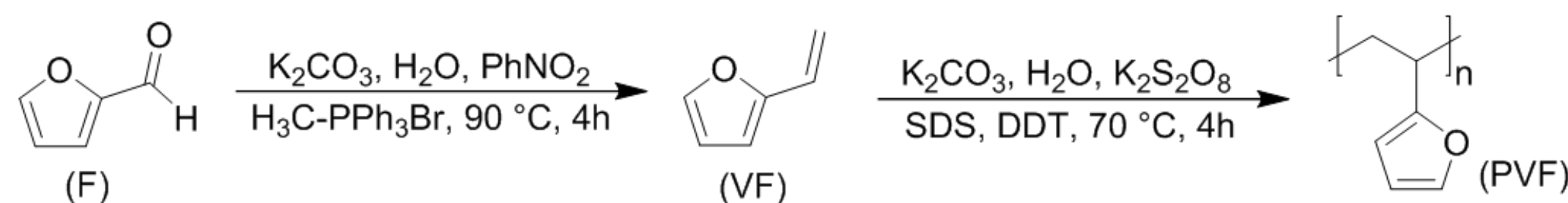


Biomass Feedstocks

- Cellulose (30-50%)
- Hemicellulose (20-40%)
- Lignin (15-25%)
- Other (5-35%)



Synthesis of poly(vinylfuran) from furfural.



NEW BIOMASS PLASTIC

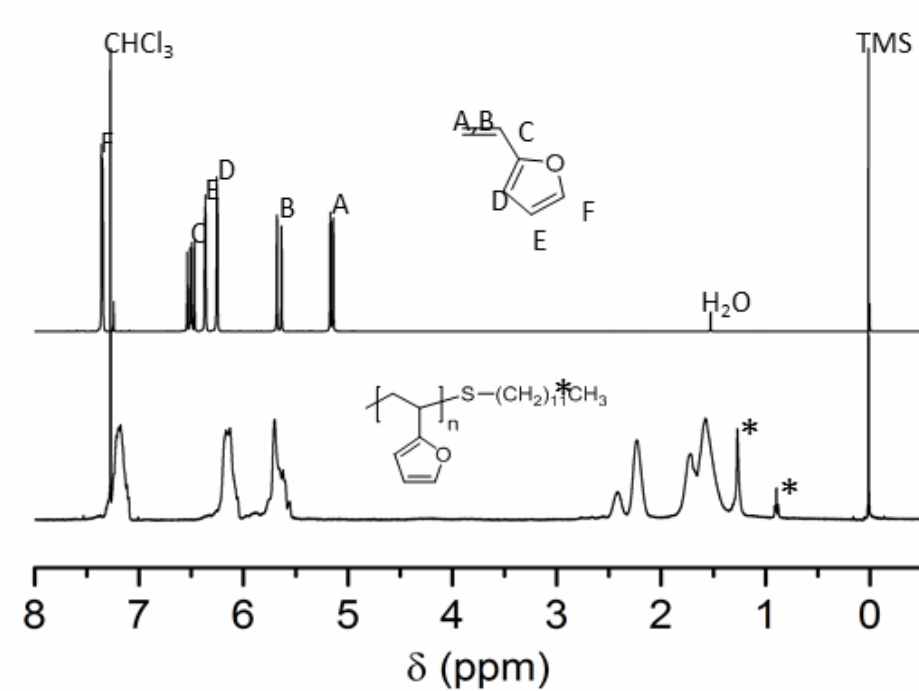


Figure. ¹H-NMR (CDCl₃) overlay of VF monomer (top) and PVF4 (bottom).

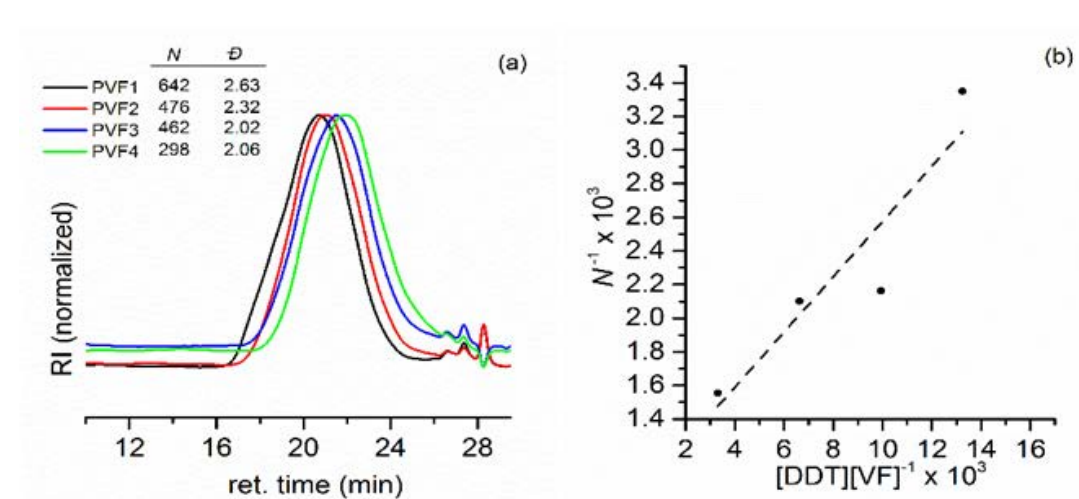
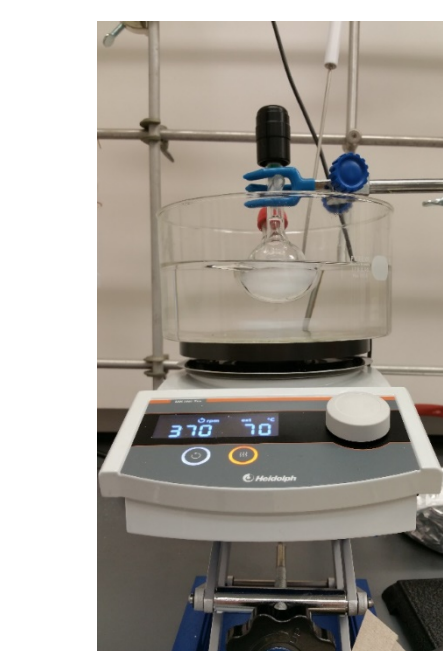
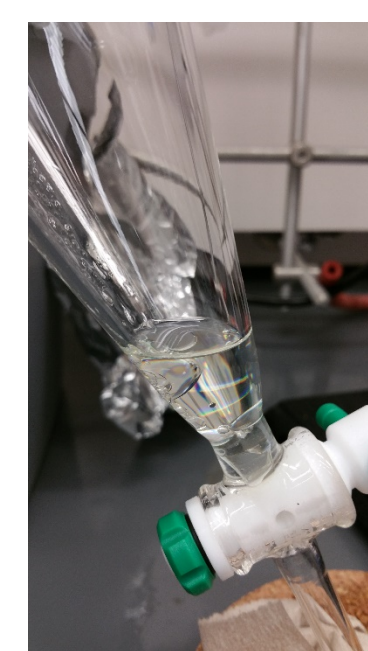
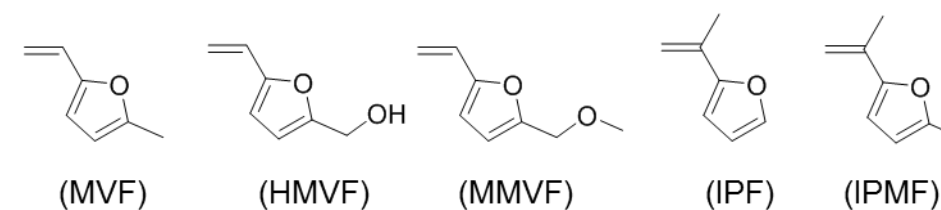


Figure. (a) SEC chromatograms of PVF samples made a varying DDT concentration. Degree of polymerization (N) and dispersity (D) values included. (b) Mayo plot of concentration ratio of [DDT] to [VF] versus inverse N for determination of DDS chain transfer constant (slope = C_s ≈ 0.16)

Future Directions:

- measuring material properties
- tuning properties by chemical design

Derivatives of VF to be investigated as monomers.



Current UROP Project:
 UV-degradation kinetics are underway to understand oxidative stability of this system

