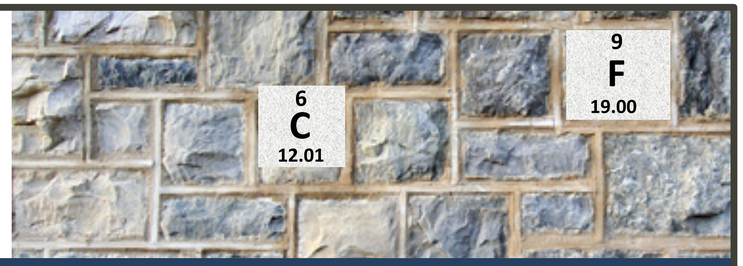
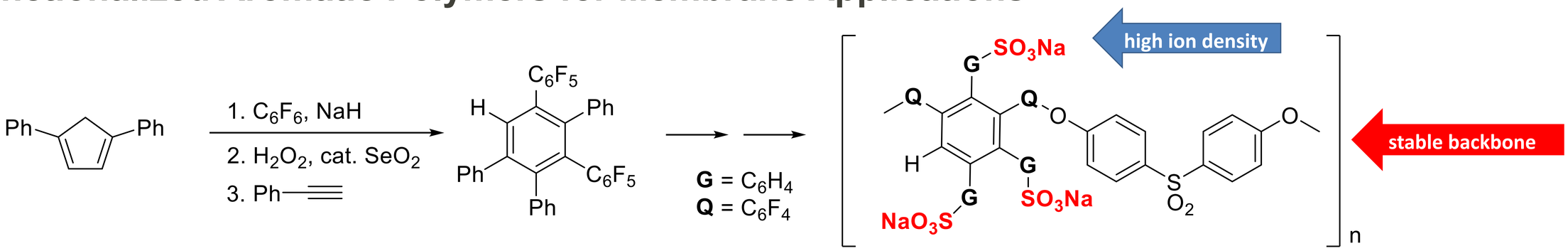
Virginia Tech | Chemistry | Deck Group



RESEARCH

1. Functionalized Aromatic Polymers for Membrane Applications

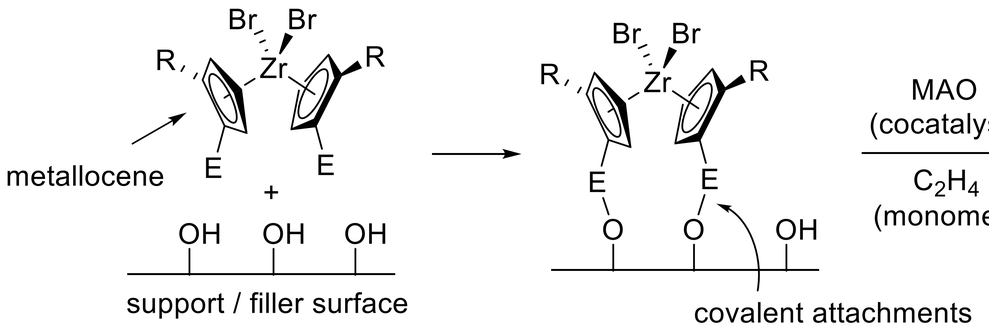


Well-precedented cyclopentadiene chemistry
Easy to modify the monomer structure

Highly sulfonated *aromatic* polymer
Monomer structure → glassy, high free volume

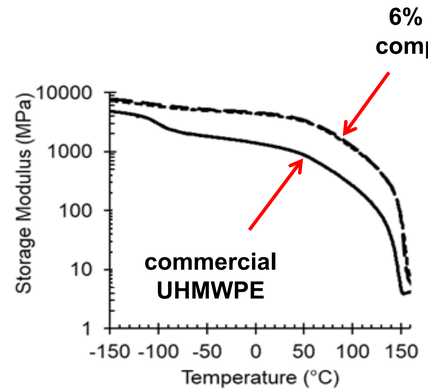
2. Using Metallocene Chemistry to Create Nanocellulose-Polyolefin Composites

Collaboration with Foster Group (MSE)



Novel catalyst anchoring technology

See our paper *in J. Appl. Polym. Sci.*



threefold increase in stiffness compared to commercial polyethylene

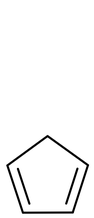
Clear, melt-pressed films

6% CNC composite **commercial UHMWPE**

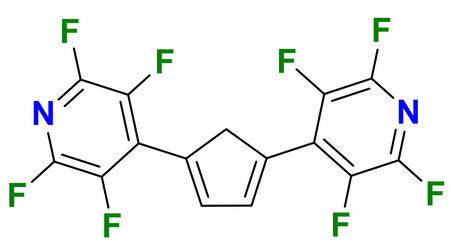
Current objectives: Cellulose-filled olefin copolymers (LLDPE) and *isotactic* polypropylene (iPP), improved boron-based anchoring chemistry.

3. Curiously Strong Carbon Acids

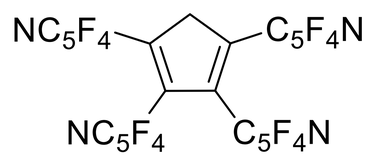
Acidity measurements by ^{19}F NMR (simple integration)
Maximum Δ(pK) = 2 units (ratio of ca. 10:1 in NMR)
Need to synthesize "stepping stones" to the strongest acids
We will make – and measure! – the strongest carbon acids known
Applications in organocatalysis, battery science, etc.



pK_a ~ 15



pK_a ~ 0.5
measured!



pK_a < –12
(estimated)

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