

Molecularly-Imprinted, Conducting Polymers for Sensing and Measurement

Azi Samadi, Ning Luo,
Scott Husson, Mike Kilbey
DEPARTMENT OF CHEMICAL ENGINEERING

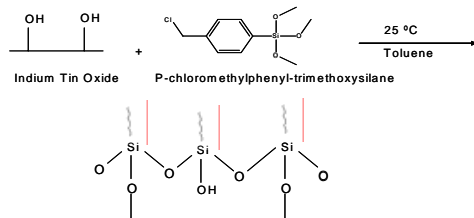
Objectives / Strategy

- Develop and test a novel method of creating molecularly- imprinted polymer films that are conductive
- Evaluate the ability of these films to selectively bind and signal the presence of pyrethroids (hazardous insecticides)
- Create conducting MIP films using 3- vinylthiophene as the monomer
- Grow films from indium-tin oxide substrates using Surface Confined Atom Transfer Radical Polymerization (SC ATRP)
- Use electrochemical polymerization to couple the thiophene groups in the presence of a pyrethroid template

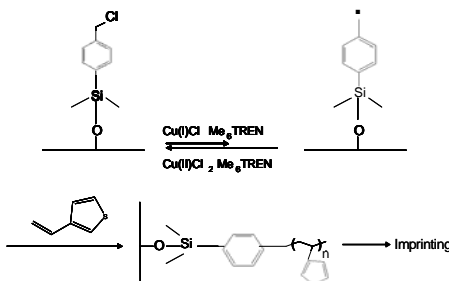
General Strategy Used to Create Molecularly Imprinted Polymer Films

1. A self-assembled monolayer (SAM) of initiator is formed on the surface
2. Poly (3- vinyl thiophene) grows via ATRP from the initiator
3. Template is added, and electrochemical polymerization cross-links the network
4. The template molecules are extracted to leave cavities that recognize and rebind the template molecules selectively

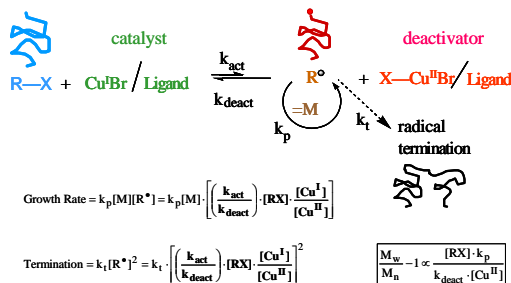
How to Create Surface-Tethered Polymer Films



How to Create Surface-Tethered Polymer Films (Contd.)



The Idea Behind ATRP and Control

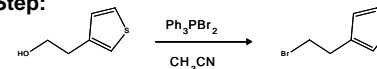


Preliminary Results

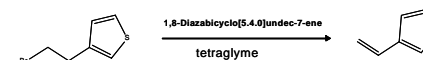
- Synthesized 3-vinylthiophene
- Prepared self-assembled monolayers on indium tin oxide (ITO) and silicon substrates
- Learned ATRP procedure by growing poly (methyl methacrylate) (PMMA) on silicon

Synthesis of 3-vinylthiophene

First Step:

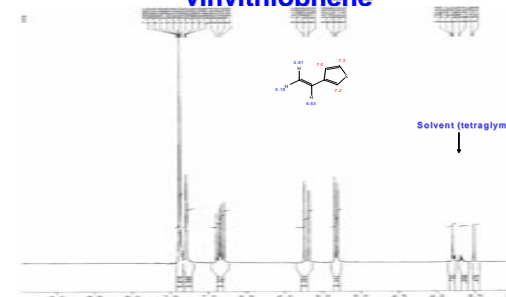


Second Step:



•The first and second steps were carried at 0 °C and 25 °C, respectively.

¹H NMR Characterization of 3-vinylthiophene



Future Work

- Discover a way to improve yield of 3-vinylthiophene through synthesis and/or separation
- Start doing ATRP with 3-vinylthiophene on ITO and silicon substrates
- Do kinetic growth rate studies using silicon as the substrate
- Do electrochemical characterization and sensing (conductivity measurements)

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