



Frontier Materials Synthesis Lab



Chin-Yang Yu

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Professor

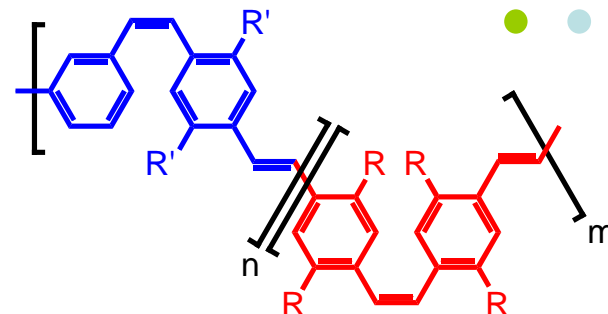
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First Phenylenevinylene Block Copolymer by ROMP

Lectures

- Organic Electro-Optical Devices
- Special Topics in Solid State Chemistry
- Organic Synthesis
- Organic Chemistry
- Chemistry

Research Interests

- Organic Photovoltaics
- Organic Field-Effect Transistors
- Conjugated Polymers
- Self-Assembly Materials

Expertise

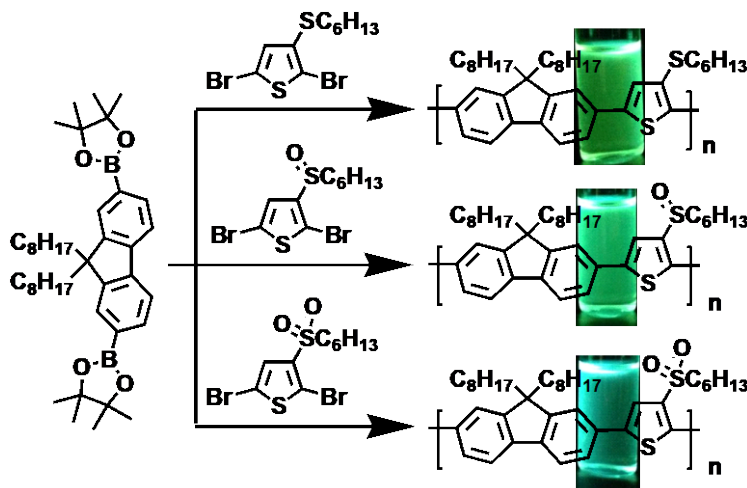
- Synthesis of Conjugated Linear and Cyclic Compounds
- Ring-Opening Metathesis Polymerization (ROMP)
- Grignard Metathesis Polymerization

The research of Prof. Yu's group covers a wide range of **small molecules and functional polymers**, in particular, focuses on the synthesis, optimization and development of these novel materials for new applications in academia as well as industry. Of particular interest is **the synthesis of novel conjugated molecules for optoelectronics such as organic light emitting diodes, organic transistors, solar cells and sensors**. Other areas of interest include **cyclic molecule and polymer synthesis, self-assembly block copolymers, cyclophane chemistry and device fabrication**.

Nonplanar, High Photoluminescent Polymers Containing Fluorene and Thiophene Derivatives –

Preparation and Characterization of Alternating Copolymers Containing Fluorene and Thiophene Derivatives

Fluorene and substituted thiophene copolymers can be synthesized by palladium catalyzed cross coupling reaction. The bulky substituent on the thiophene ring of the copolymer results in the steric hindrance and hence decreases the interchain interaction. The interruption of conjugation length through the non-planar conformation leads to increase the fluorescence quantum yield.



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Low Bandgap Polymers with Alternating D-A Structures -- Synthesis, Characterization, Optical and Electrochemical Properties of Cyclopentadithiophene and Fluorene Based Conjugated Polymers Containing Naphthalene Bisimide



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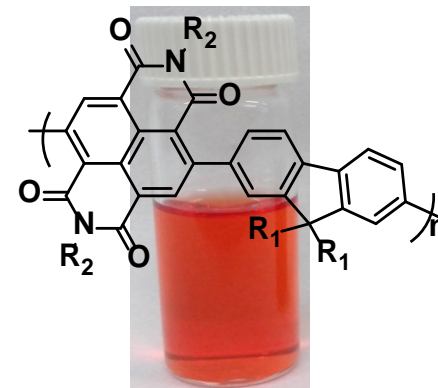
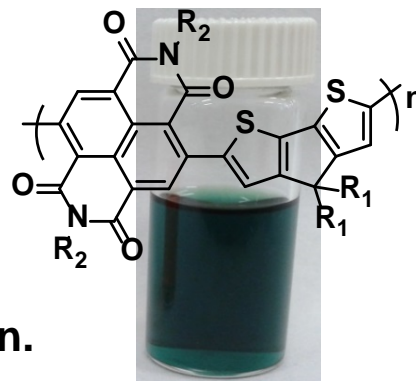
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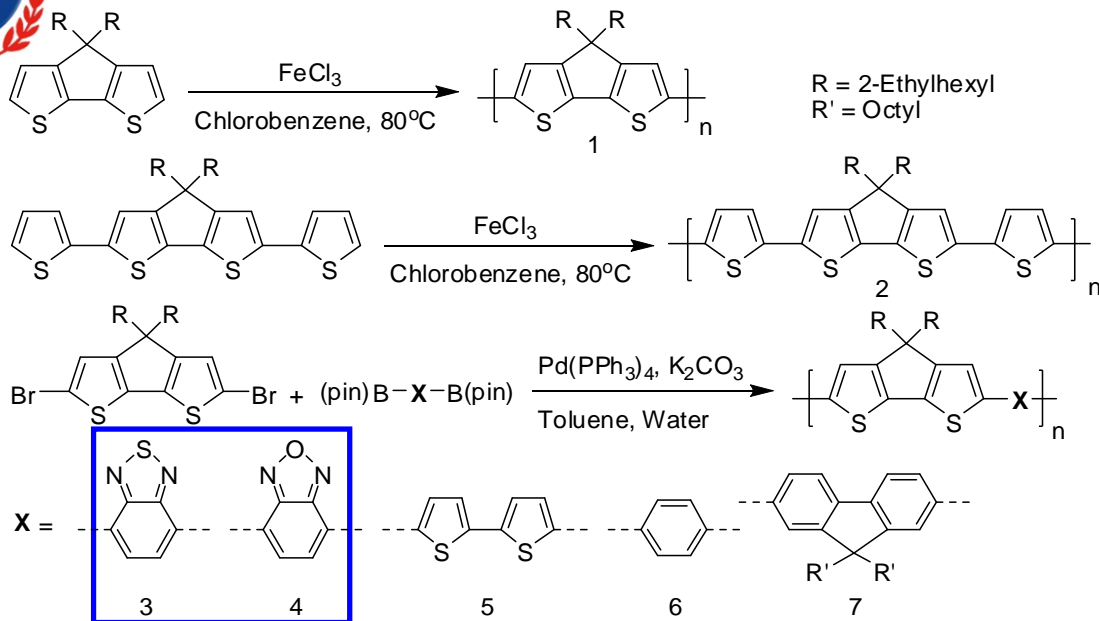
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Alternating polymers containing cyclopentadithiophene and naphthalene bisimide moieties showed relative low bandgap than fluorene and naphthalene bisimide containing polymers.

1. Polymers containing electron rich and electron deficient units have been prepared.
2. Increasing the conjugation length of copolymers leads to decrease the bandgap.
3. No fluorescence can be found due to intramolecular charge transfer interaction.
4. The absorption band of copolymers covers the entire visible region.



CPDT Polymers



$M_n \sim 15,000$
 Mobilities up to $4 \times 10^{-3} \text{ cm}^2/\text{Vs}$



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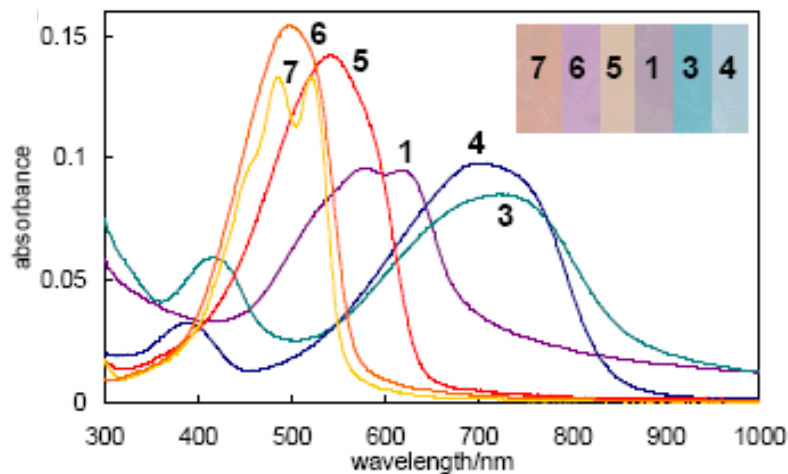
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UV-vis in Film





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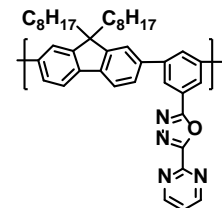
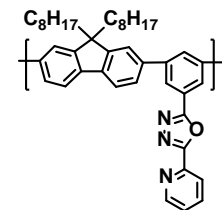
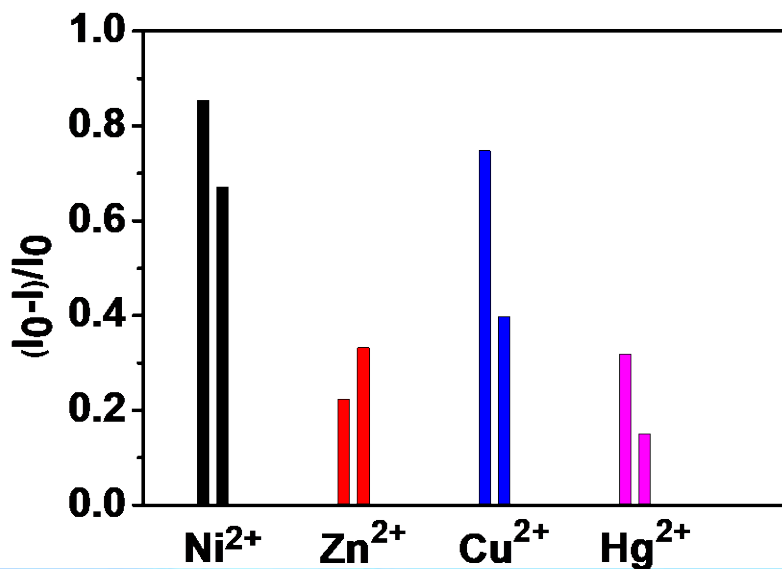
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Conjugated Polymers Containing Oxadiazole Moieties for Fluorescent Chemosensors –

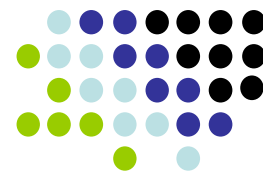
Alternating Copolymers Containing Fluorene and Oxadiazole Derivatives for Fluorescent Chemosensors

The alternating copolymers containing 9,9-dioctylfluorene and *meta*-phenylene linked 2-pyridyl-1,3,4-oxadiazole and 2-pyrimidyl-1,3,4-oxadiazole have been synthesized through palladium catalyzed cross coupling reaction. The sensing behaviors reveal that the polymers are highly sensitive to Ni²⁺ and Cu²⁺ ions.



Preparation and Characterization of Alternating Copolymers Containing Fluorene and Hexyl or Perfluorohexyl Substituted Thiophene

Alternating copolymers containing fluorene and hexyl or perfluorohexyl substituted thiophene were synthesized. The optical properties of those polymers have been reported and revealed different phenomenon between solution and solid state.



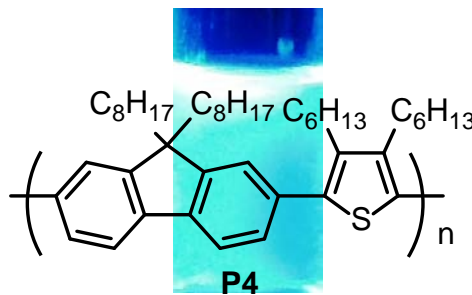
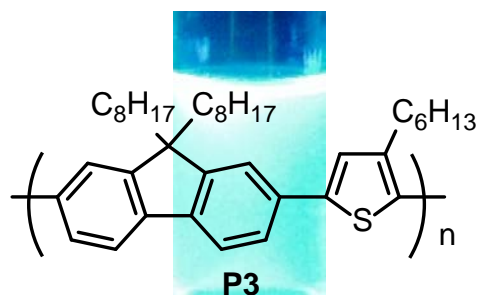
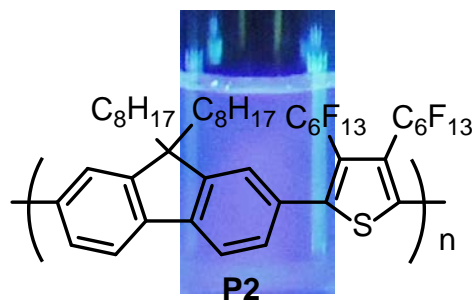
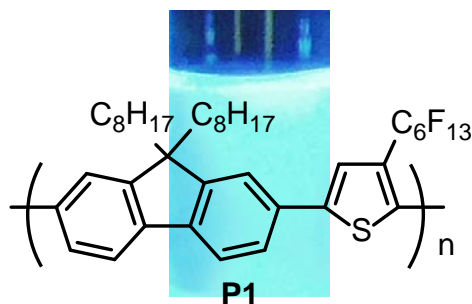
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Synthesis and characterization of alternating copolymers containing bipyridine and phenylenevinylene for fluorescent chemosensors

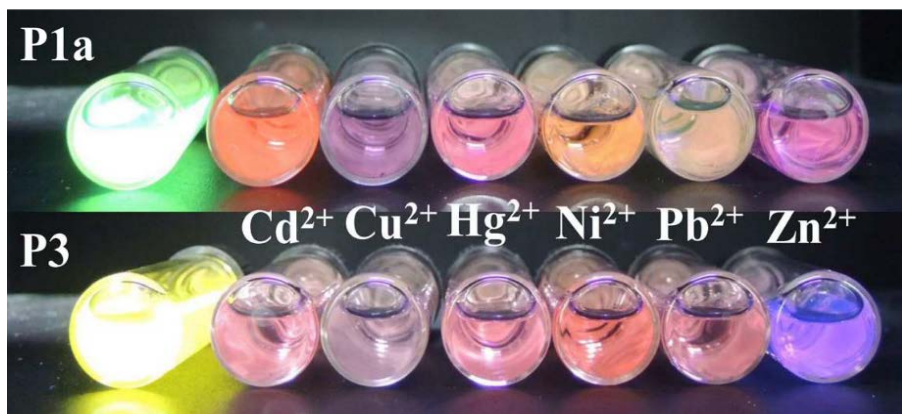
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Alternating polymers containing bipyridine and phenylenevinylene were synthesized by Wittig condensation reaction. The effective conjugation length can be extended as the addition of Cu^{2+} , Ni^{2+} and Zn^{2+} ions into the polymer solutions comprising of 1:1 ratio of the bipyridine to the phenylenevinylene units. The conjugated polymers performed their intended role as a turn-off fluorescent chemosensors for Cd^{2+} , Cu^{2+} , Hg^{2+} , Ni^{2+} , Pb^{2+} and Zn^{2+} ions.

Synthesis, characterization, optical and electrochemical properties of spirobifluorene based polymers containing electron deficient moieties



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2,7-linked or 2,2'-linked 9,9'-spirobifluorene based polymers containing electron deficient moieties such as naphthalene bisimide and/or benzothiadiazole were synthesized through Suzuki cross-coupling reaction. Alternating polymers containing spirobifluorene and naphthalene bisimide moieties showed a low band gap relative to that of the spirobifluorene and benzothiadiazole containing polymers and their random copolymers presumably there is a strong charge transfer interaction between the alternating electron-donating spirobifluorene unit and the electronaccepting naphthalene bisimide.

