Blcok copolymer-based nanocomposites for artificial photosynthesis

Scientific Achievement

We have demonstrated the ability to generate polymer-based nanocomposites that exhibit energy transfer or quenching photonic dynamics in non-covalent supramolecular assemblies. Results indicate it is possible to tune the nature of the photonic response by adjusting the physical properties of cofactors and polymers being used.

Significance and Impact

- **Results demonstrate potential of designing responsive photonic materials for light-harvesting/energy transfer and charge separation.**
- **Materials assemblies rely upon non-specific interactions alleviating burden and cost of complex covalent constructs.**
- **Polymers allow for built in functionality and exploration of incorporation of other nanoscale cofactors**

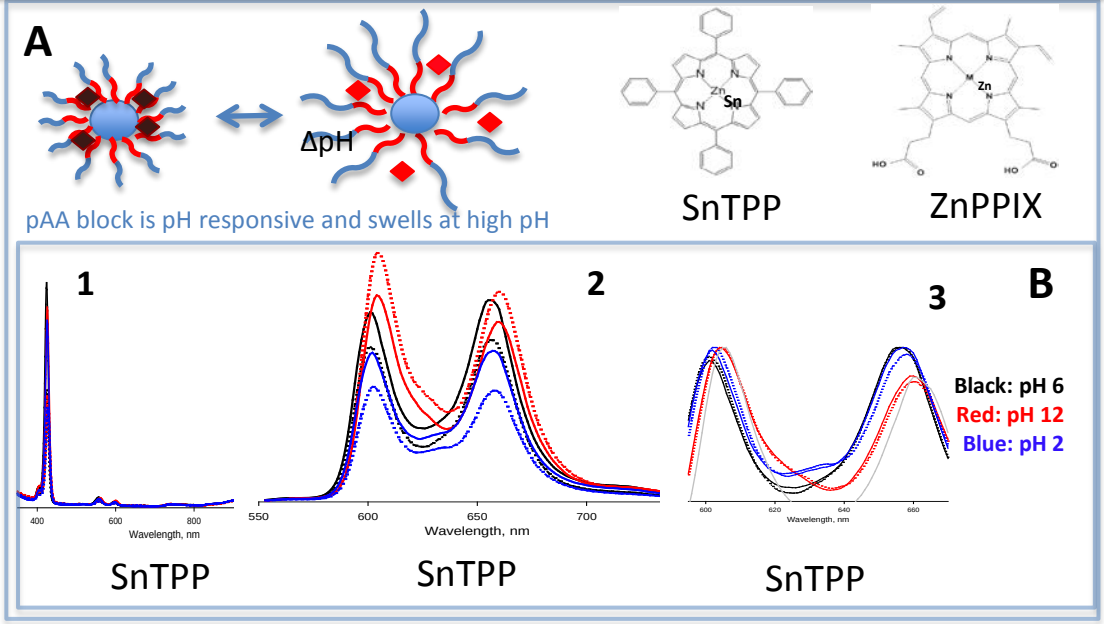
Research Details

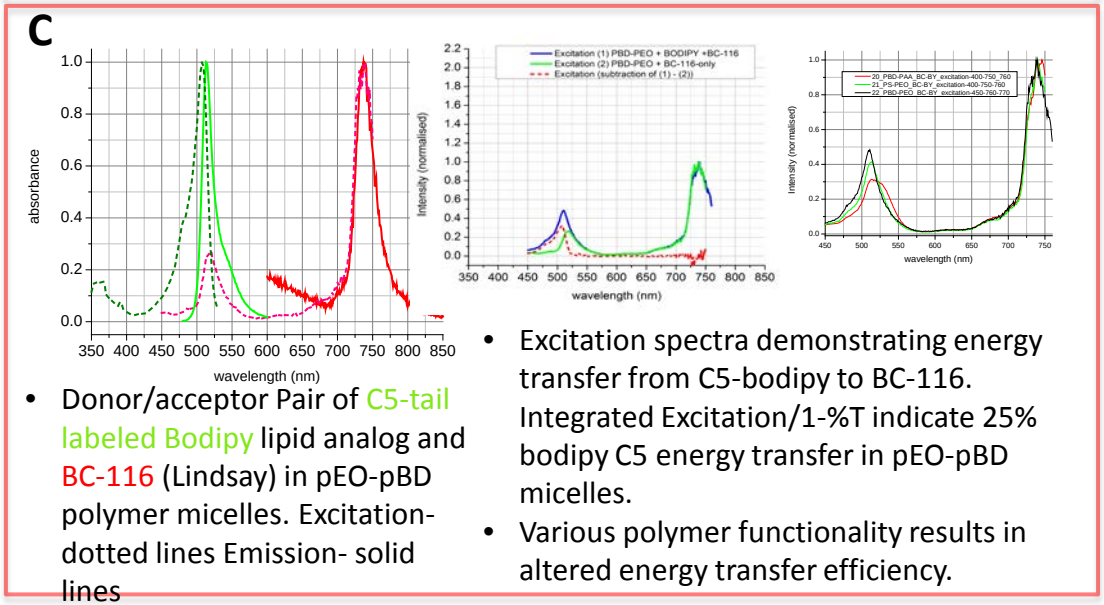
Responsive quenching in CNT-porphyrin polymer composites

- Hydrophobic (SnTTP) NT-wrapped porphyrin polymer micelles exhibit pH responsive flourescence quenching relative to pH. At low pH the pAA-b-pS block copolymer micelle contracts resulting in fluorescence quenching. At high pH micelle is swelled due to pAA elongation. pH responsive fluorescence is reversible.**(B)**
- Response only observed w/pH responsive polymer.

Energy Transfer in Dye-bacteriochorin polymer composites

- Up to 25% energy transfer observed between C5-bodipy labeled lipids and BC-116.
- Response dependent upon polymer matrix.
- Responsive energy transfer being investigated





- Donor/acceptor Pair of C5-tail labeled Bodipy lipid analog and BC-116 (Lindsay) in pEO-pBD polymer micelles. Excitation-dotted lines Emission- solid lines
- Excitation spectra demonstrating energy transfer from C5-bodipy to BC-116. Integrated Excitation/1-%T indicate 25% bodipy C5 energy transfer in pEO-pBD micelles.
- Various polymer functionality results in altered energy transfer efficiency.

U.S. DEPARTMENT OF ENERGY

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