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Controlling Supramolecular Polymerization by Living Electrogenic Bacteria

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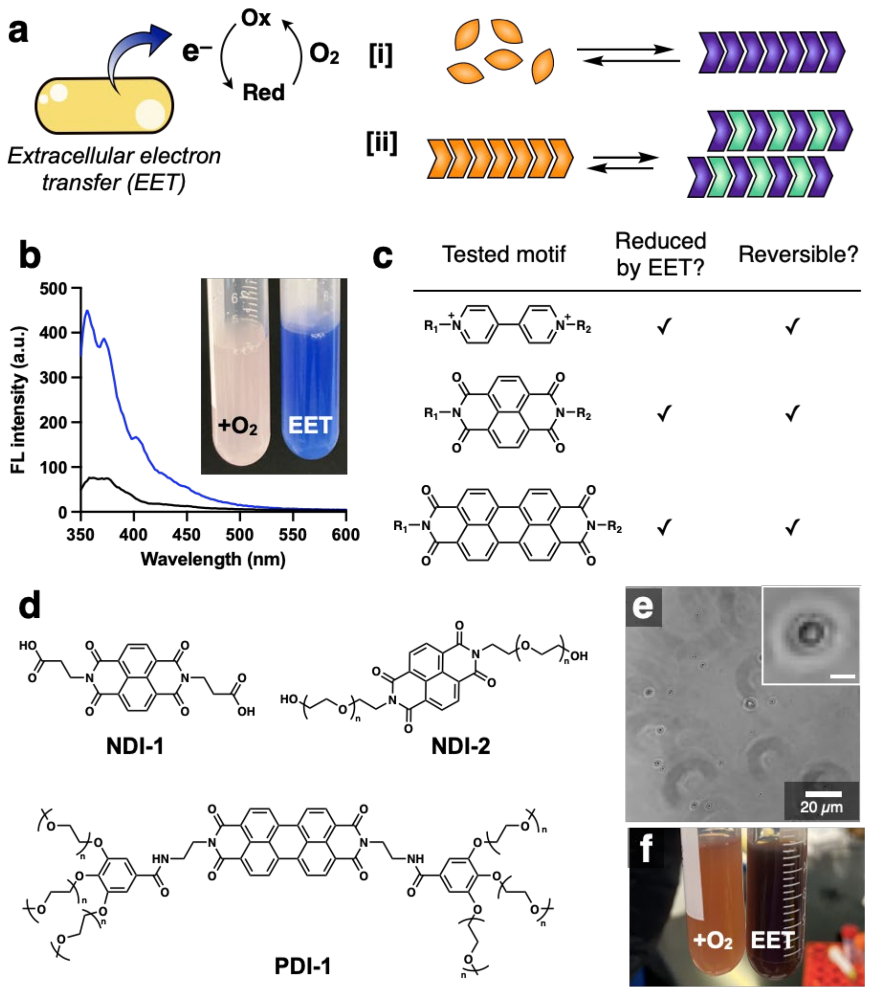
The **main objective** of this research project is to construct supramolecular materials interacting with electrogenic bacterial cells and elucidate how bioelectricity dynamically interacts with supramolecular polymers (Figure a).

The **expected outcome** of this research is novel dynamic supramolecular dissipative systems controlled by electrogenic bacteria, *S. oneidensis*.

The **outcome** during the reporting period are the followings:

- Establishing that EET and oxygen can be harnessed for dissipative supramolecular systems (Figure a–f).
- Establishing the anaerobic culture conditions and biological reduction workflow with S. oneidensis (Figure b)
- Confirming the central hypothesis that *S. oneidensis* EET can reduce various molecular motifs useful for supramolecular construction of polymers (Figure c)
- Design and synthesis of supramolecular aggregates responsive to EET (Figure d–f)



a) Schematic illustration of the extracellular electron transfer (EET) from electrogenic bacteria *S. oneidensis* and O_2 mediated reversible control for supramolecular dissipative assembly. These two stimuli are expected to [i] grow and [ii] control supramolecular polymers. (**b**) A representative data set demonstrating characterization of the reduction by colorimetric change and fluorescence emission. (**c**) Summary of reversibly controllable molecular motifs by EET identified from this study. (**d**) Supramolecular polymer building blocks synthesized and tested in this project. (**e**) Micron-sized circular aggregates formed by supramolecular association of NDI-1 in a common buffer solution. Inset scale bar = 2 *μ*m. (**f**) Visible colorimetric change of the NDI-1 building block upon *in situ* reduction via EET and reversible change upon exposure to oxygen.