

# Energy and Electron Transfer in Ru(II) Polyfluorene Polymers

Meyer

## Scientific Achievement

Polymer provides efficient light harvesting and energy transport that enables energy to be collected and funneled to specific locations.

## Significance and Impact

Polyfluorene (PF) is a multichromophoric antenna (not just a scaffold) that absorbs and transfers energy to pendant Ru (II) complexes that can be used for charge separation and catalytic functions.

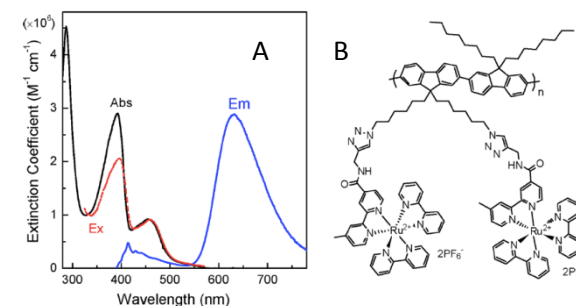
## Research Details

- Emission of PF with Ru (PF-Ru) shows a weak PF emission band but intense <sup>3</sup>MLCT Ru (II) emission, indicating significant excitation energy transfer (450 fs).
- In the presence of Ru(II), the PF\* spectrum disappears fast, replaced by bleach features at 406, 450 and 550 nm.
- The 406 and 550 nm bands decay at the same time and are assigned to the formation of a charge-separated state by electron transfer from PF\* to Ru(II) (1.5 ps) and back-electron transfer (20 ns).
- The 450 nm band is likely due to Ru(II)\* formed by energy transfer.
- Energy/electron transfer occur on ultrafast timescales.

Work was performed at the University of North Carolina at Chapel Hill

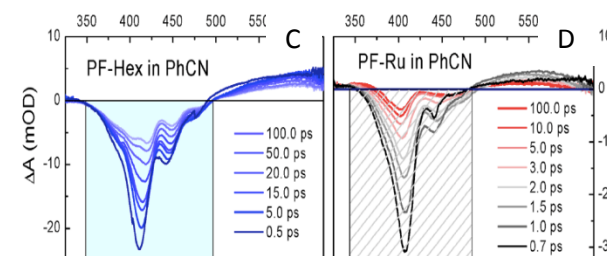
A) Steady-state spectra of PF-Ru in benzonitrile at room temperature.

B) Structure of PF-Ru



Ground-state bleach of (C) PF-Hex and (D) PF-Ru.

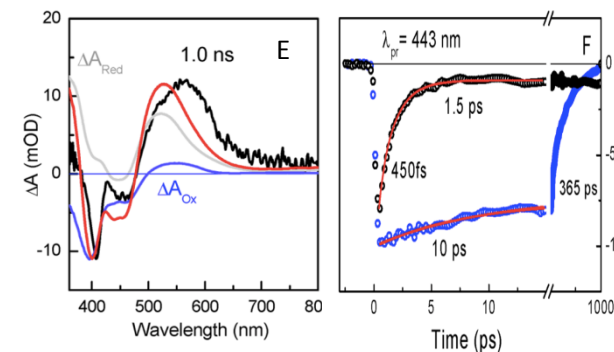
Note the red-shift in the stimulated emission bands of PF-Hex that is not present in PF-Ru.



E) Transient absorption spectra of the reduced, neutral and oxidized PF-Ru.

$\Delta A_{\text{Red}}$  is the difference between reduced and neutral PF-Ru, and  $\Delta A_{\text{Ox}}$  is difference between oxidized Ru(III)/PF and neutral PF-Ru.

F) Kinetic traces of PF-Ru at 388 nm excitation.



Wang, L., Puodziukynaite, E., Vary, R.P., Grumstrup, E.M., Walczak, R.M., Zolotarskaya, O.Y., Schanze, K.S., Reynolds, J.R., Papanikolas, J.M.; *J. Phys. Chem. Lett.*, **2012**, 3, 2453-2457.



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