Probing the Conformation of Foldamers in Solution through Fluorescence Anisotropy

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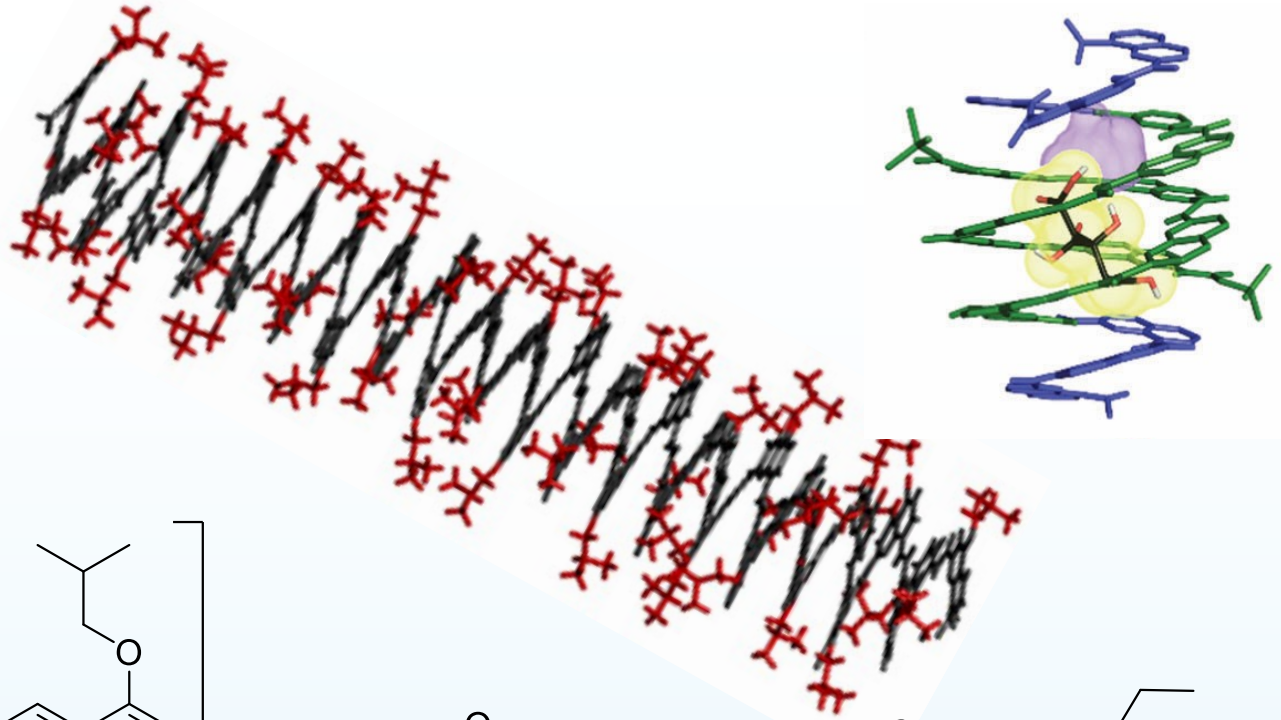
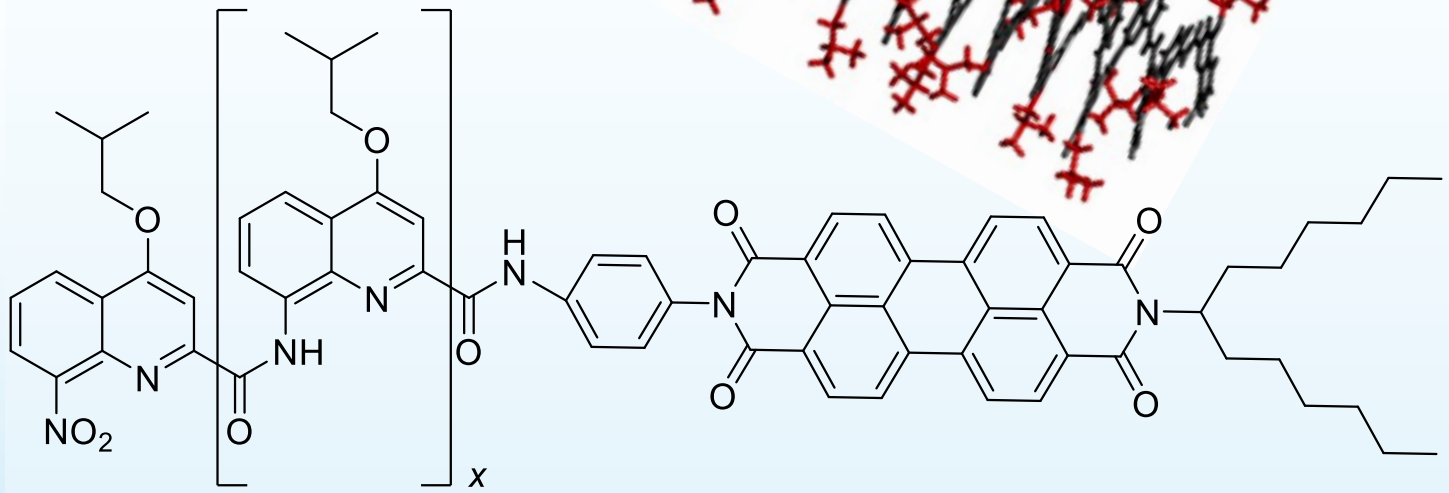
Foldamers



- Synthetic macromolecules that fold into well defined structures
- Biotic or abiotic backbones
- Can mimic the electron transport properties of natural biological molecules
- Can be used to encapsulate small molecules
- Physical properties are easily controlled during synthesis

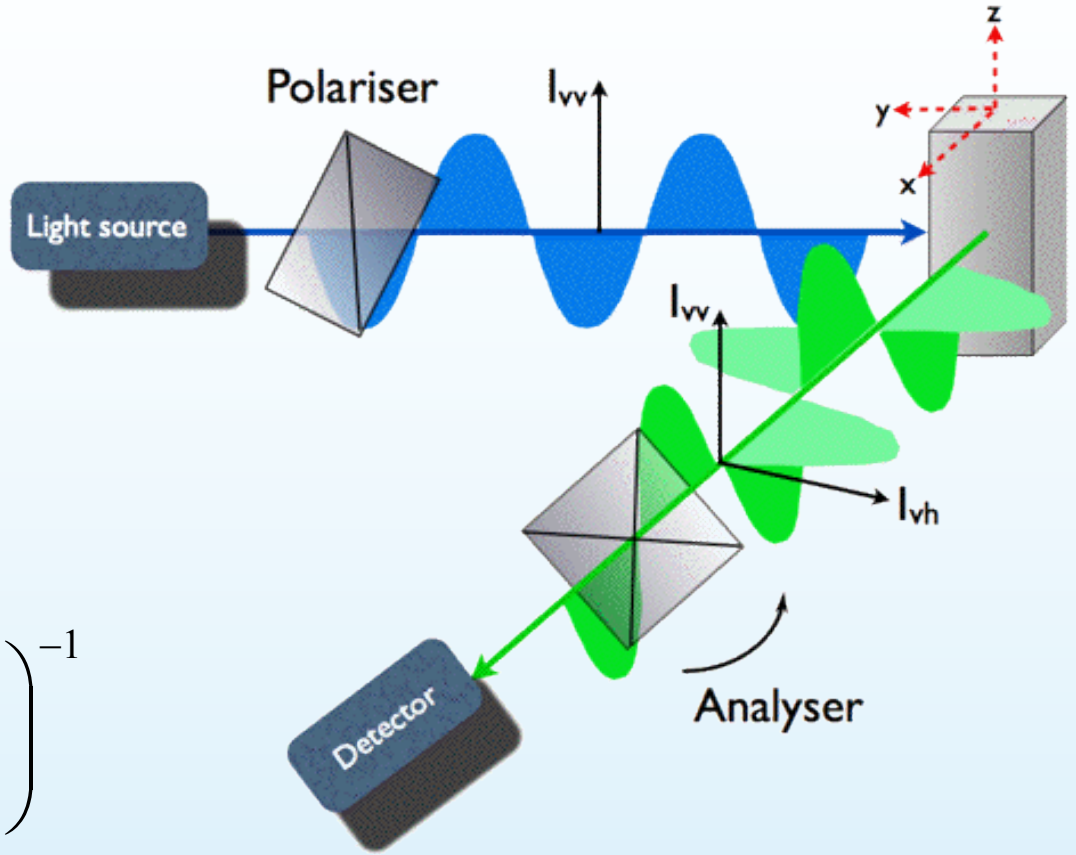


Perylene labelled foldamer where x = 1, 7, 15, 31

1: Li, X.; Qi, T.; Srinivas, K.; Massip, S.; Maurizot, V.; Huc, I. Synthesis and Multibromination of Nanosized Helical Aromatic Amide Foldamer via Segmetn-Doubling Condensation. *Org. Lett.* **2016**,*18* 1044
2: Li, X.; Markandeya, N; Jonusauskas, G.; McClenaghan, N.; Maurizot, V; Denisov,S.; Huc, I. Photoinduced Electron Transfer and Hole Migration in Nanosized Helical Aromatic Oligoamide Foldamers. *J. Am. Chem. Soc.* **2016,** *138*, 13568
3: Chandramou, N.; Ferrand, Y.; Kauffmann, B.; Huc, I. Citric acid encapsulation by a double helical foldamer in competitive solvents. *Chem. Comm.* **2016,** *52*, 3939

Fluorescence Anisotropy

- Plane polarized light is used to excite a sample
- Polarized emission is measured parallel and perpendicular to the excitation
- The two fluorescence decays are analyzed globally to retrieve the tumbling time of the sample
- This rotational time is proportional to the volume of the macromolecule



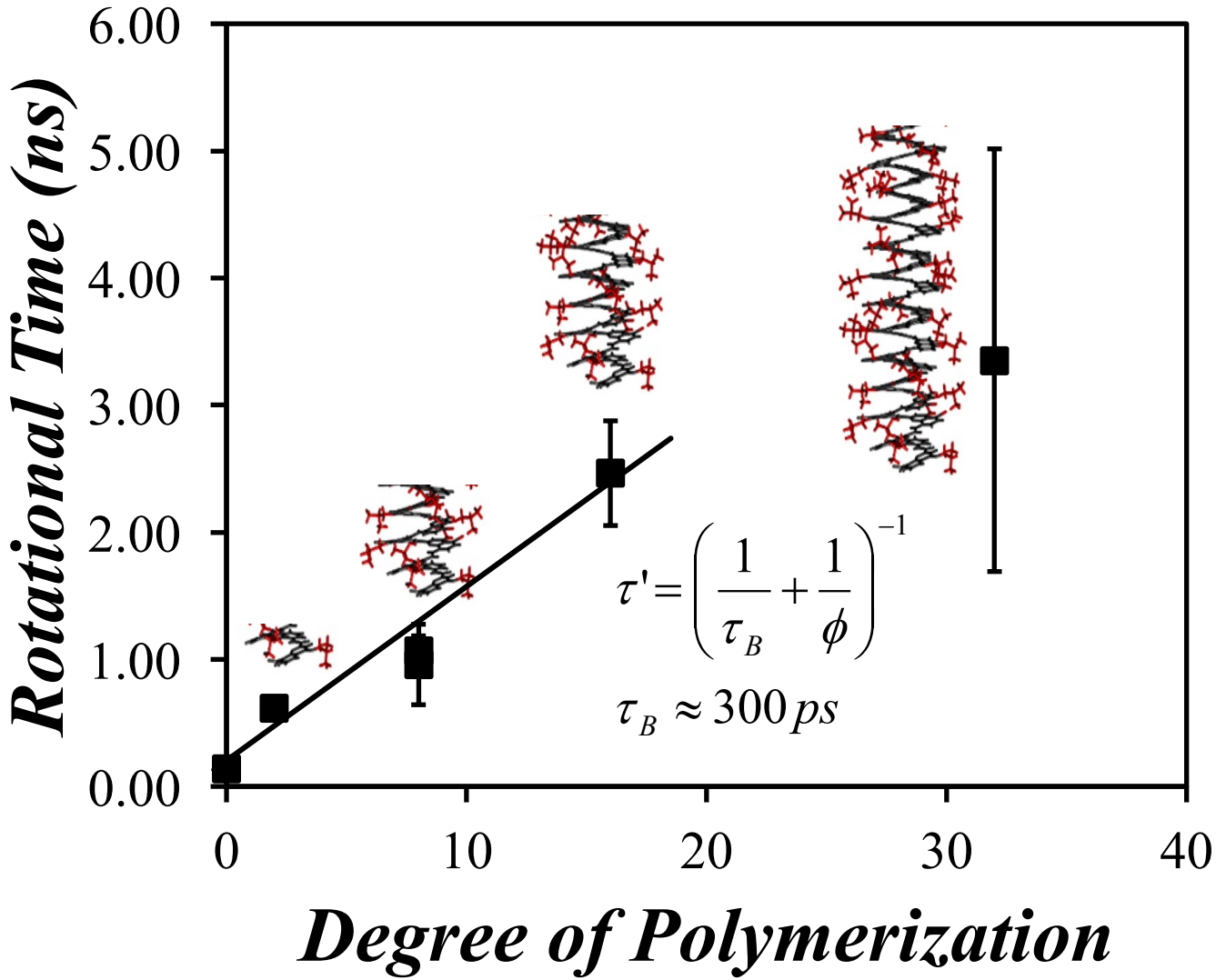
$$\phi = \frac{\eta}{RT} V \qquad \tau' = \left(\frac{1}{\tau_B} + \frac{1}{\phi} \right)^{-1}$$

$$V = \pi r^2 (x \Delta h) \qquad \tau_B \approx 300\,ps$$

4: Lakowicz, J. R.. *Principles of Fluorescence Spectroscopy* (3rd ed.) . New York: Springer Science **2006**, 353 - 412
5: Visser, A., & Rolinski, O.. *Basic Photophysics*. Retrieved Feb 24, 2016 from http://photobiology.info/Visser-Rolinski.html

Results

- Rotational time increases with increasing degree of polymerization
  - Expected if the helical foldamers are approximated as cylinders
- High error at x = 32 due to large rotational time and small fluorescence lifetime
- Next step is to used a different dye with a longer lifetime



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