Using Visible Light to Probe Interparticle Diffusion in Latex Films

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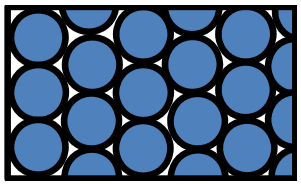
Latex Film Formation

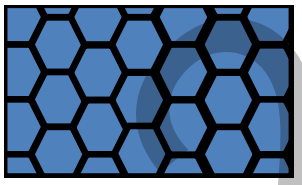
Latex: A stable dispersion of polymer particles in an aqueous solution

Stage 1:
Water Evaporation



T > MFT

Stage 2:
Particle Deformation



- Brittle
- Water Permeable

T > MFT

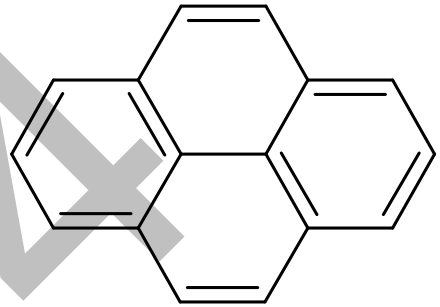
Stage 3:
Coalescence

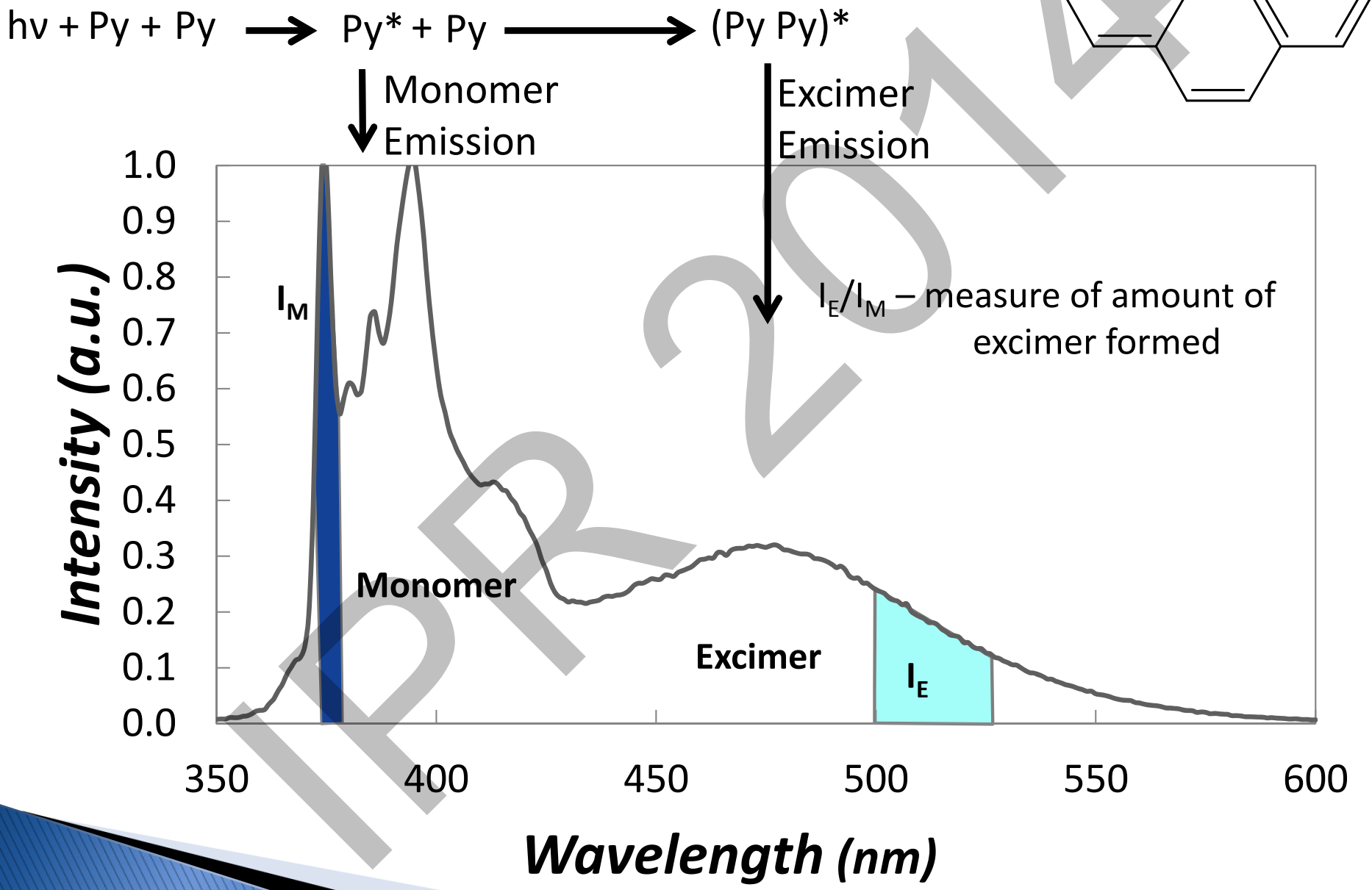
- Tough
- Water Resistant

- A minimum film formation temperature (MFT) must be reached before polymer chains can interdiffuse (MFT ≈ T_g)[1]
- Interparticle polymer diffusion (IPD) during coalescence produces a homogeneous film

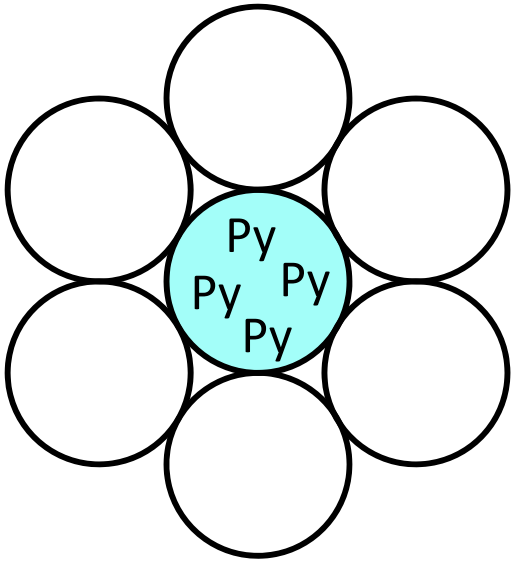
1. Zhao, C., Wang, Y., Hruska, Z., Winnik, M. Molecular Aspects of Latex Film Formation: An Energy-Transfer Study; *Macromolecules* **1990**, 23, 4082-4087.

Pyrene





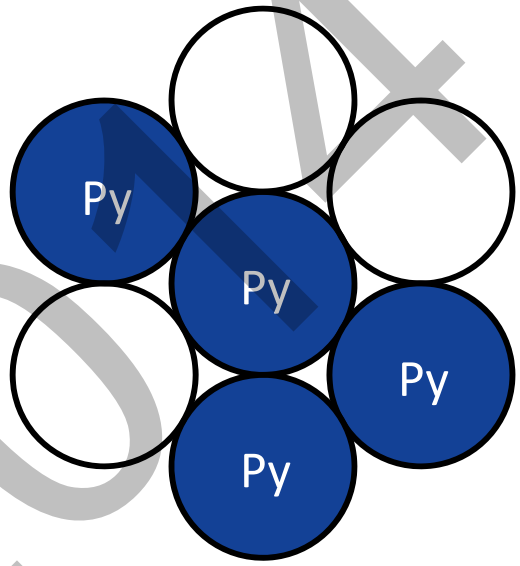
Interparticle Polymer Diffusion



t=0

- High I_E/I_M
- $f_{mix} = 0$

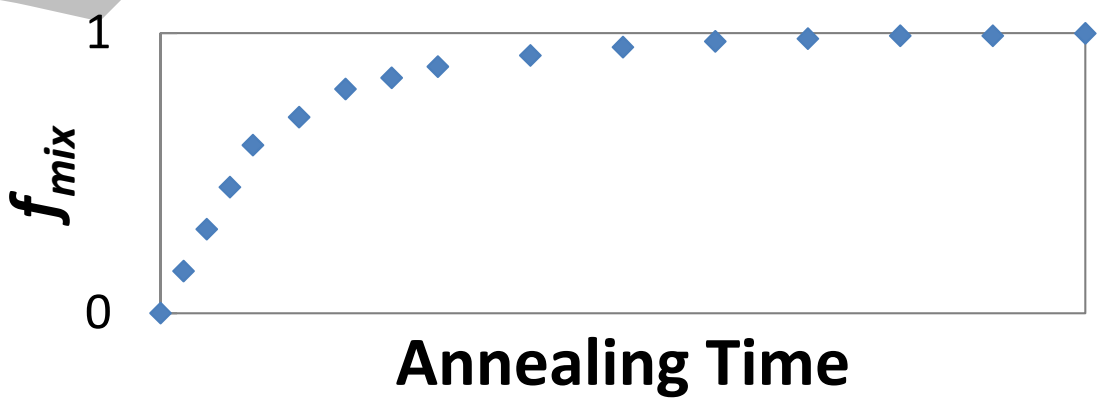
T > MFT



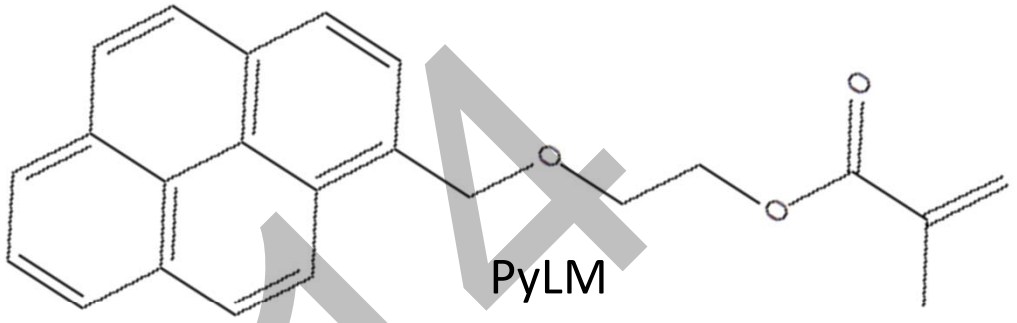
t>0

- Low I_E/I_M
- $0 < f_{mix} \leq 1$

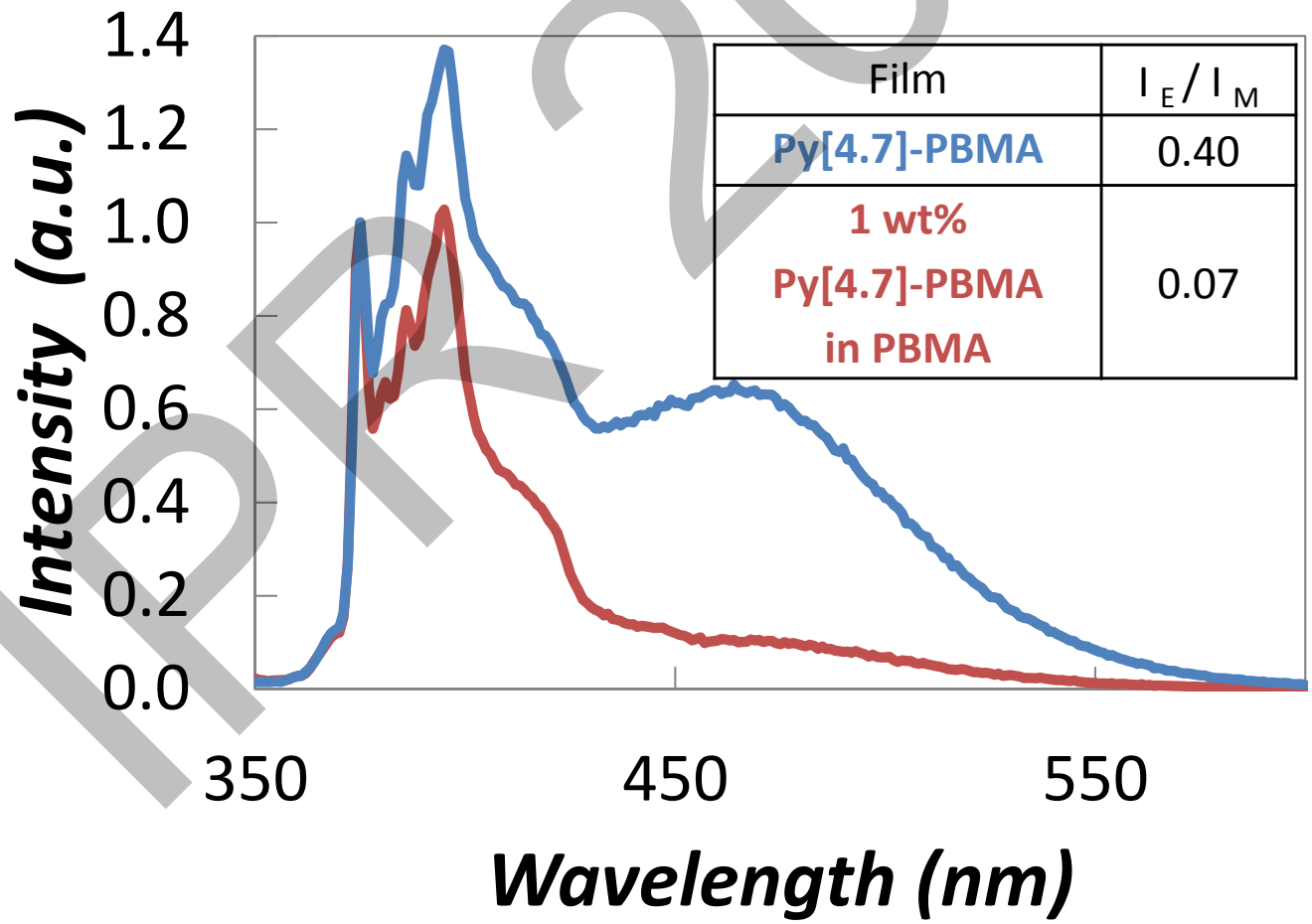
$$f_{mix}(t) = \frac{\left(\frac{I_E}{I_M}\right)_{(t)} - \left(\frac{I_E}{I_M}\right)_{(t=0)}}{\left(\frac{I_E}{I_M}\right)_{(t_\infty)} - \left(\frac{I_E}{I_M}\right)_{(t=0)}}$$



Preliminary Results



- A pyrene labeled monomer (PyLM) was synthesised and copolymerized with *n*-butyl methacrylate to yield a pyrene labeled copolymer with 4.7 mol% of the PyLM incorporated into the polymer (Py[4.7]-PBMA)



Acknowledgements

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