

Probing the Interactions between Pyrene-labeled Surfactants and Non-Gemini Surfactants by Fluorescence

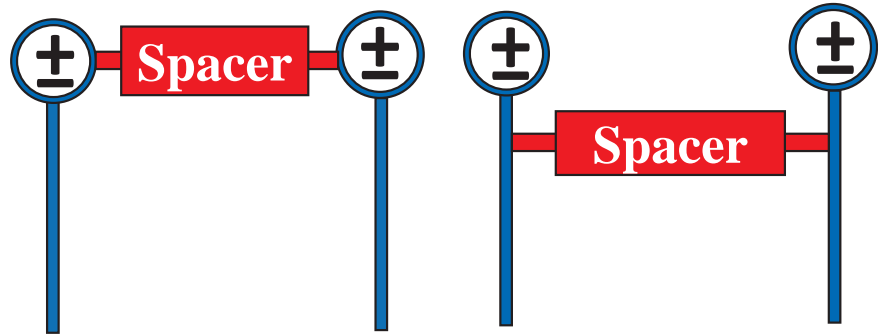
By
Abdullah Ba Salem
Supervisor: Prof. Jean Duhamel

May 3, 2017

Outline

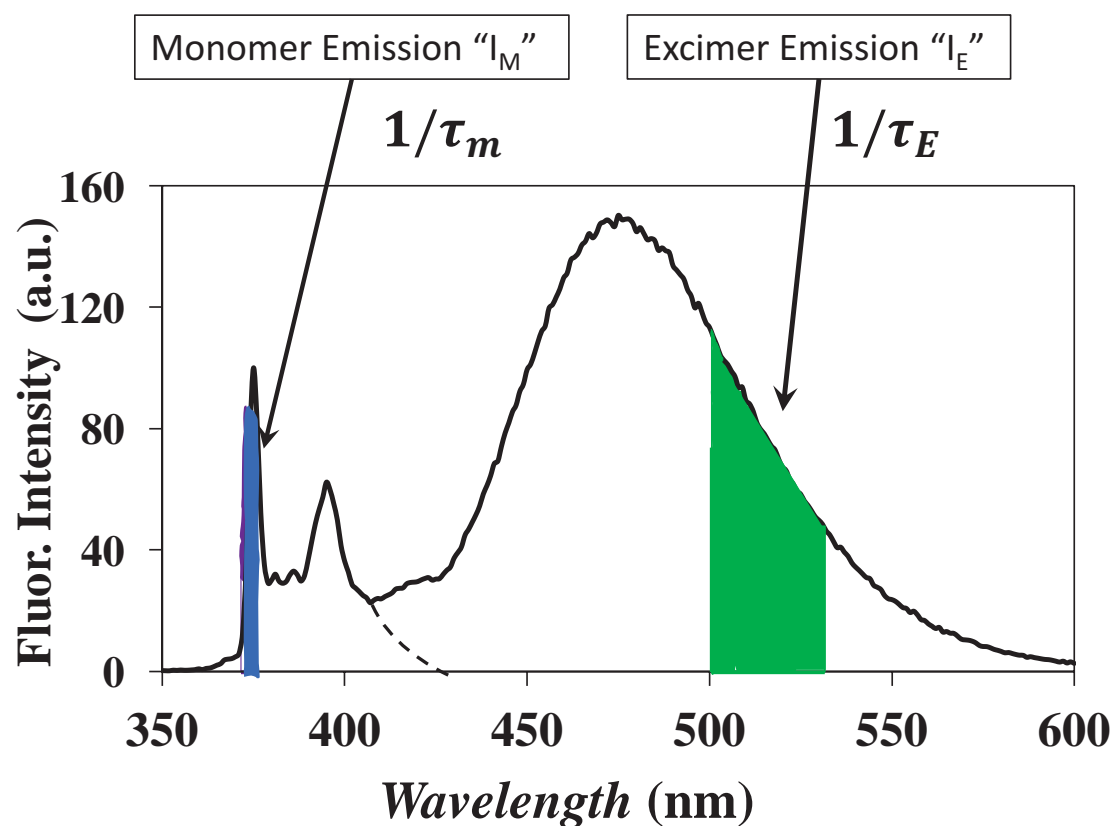
- **Literature Review**
 - **Gemini Surfactants**
 - **Pyrene Excimer Formation**
 - **Previous Probe**
- Results and Discussions
- Summary

Gemini Surfactants

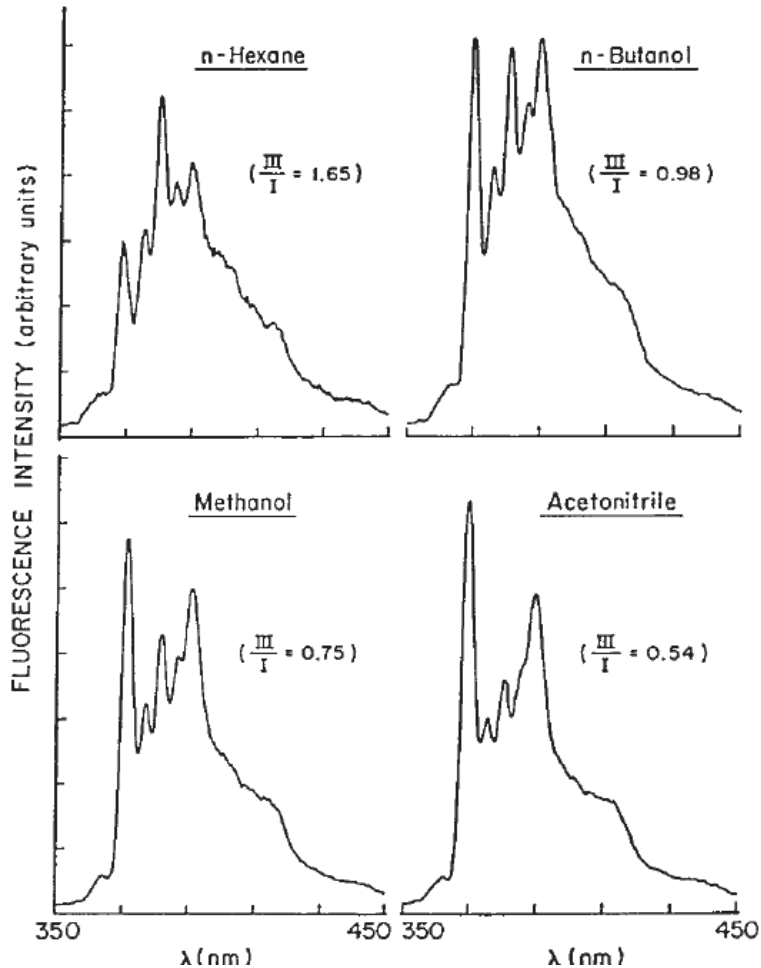


- More than one fold of magnitude lower CMC than its regular counterparts.
- More efficient in lowering water surface tension.

Pyrene Excimer Formation



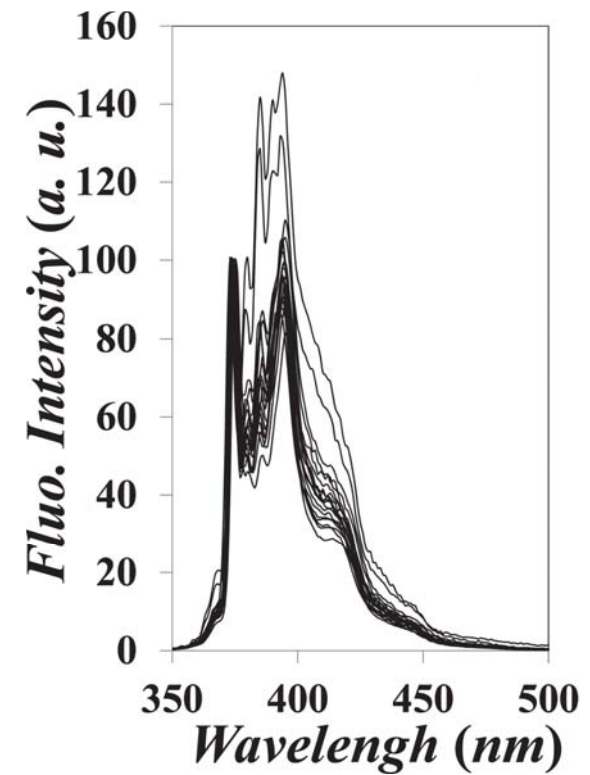
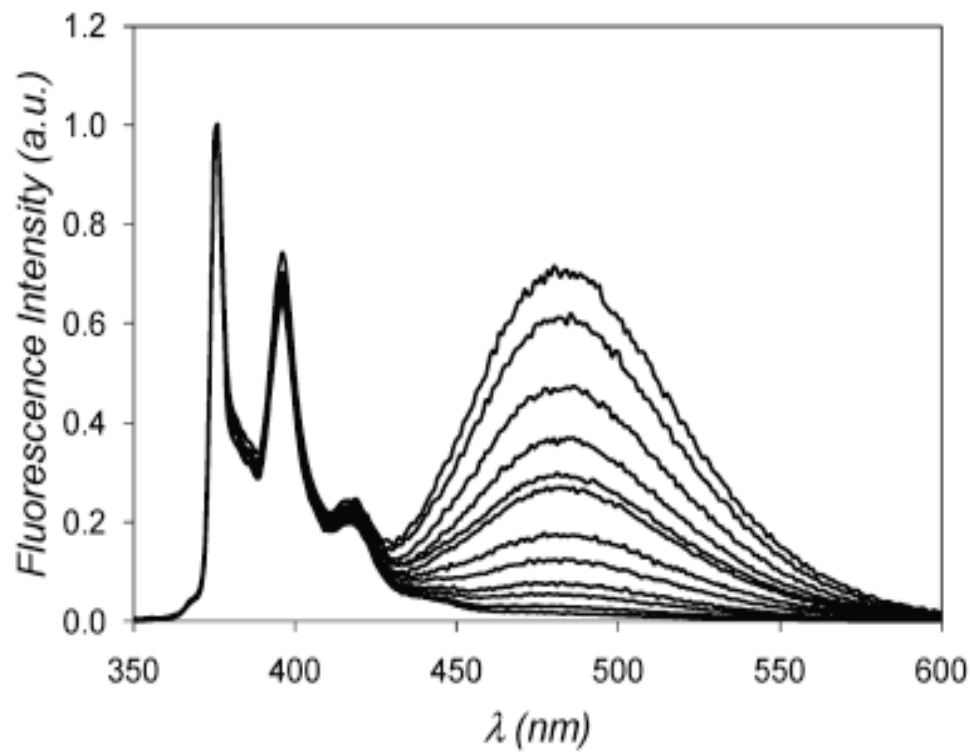
Pyrene Excimer Formation



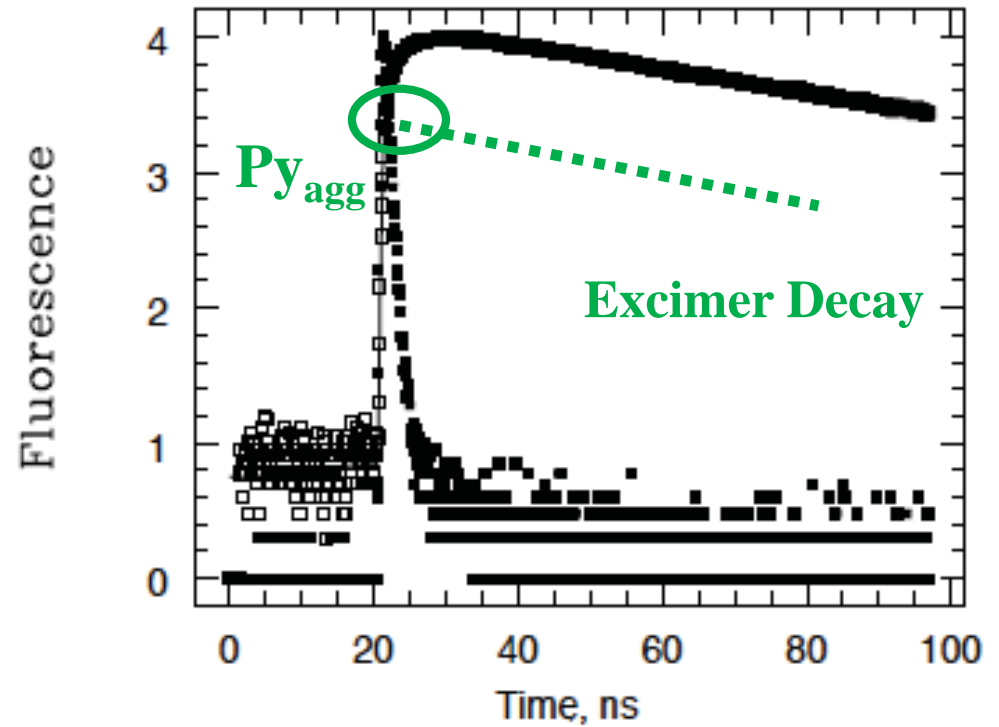
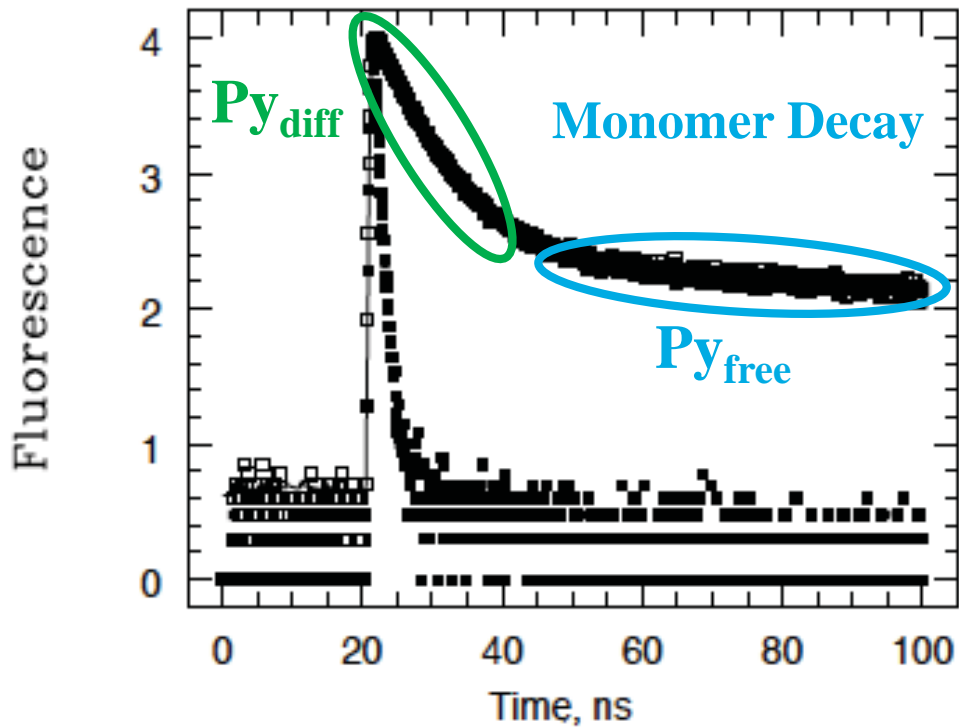
I_1/I_3 is indicative of the polarity of pyrene's local environment.

I_E/I_M is indicative of the amount of excimer formation.

Pyrene Excimer Formation



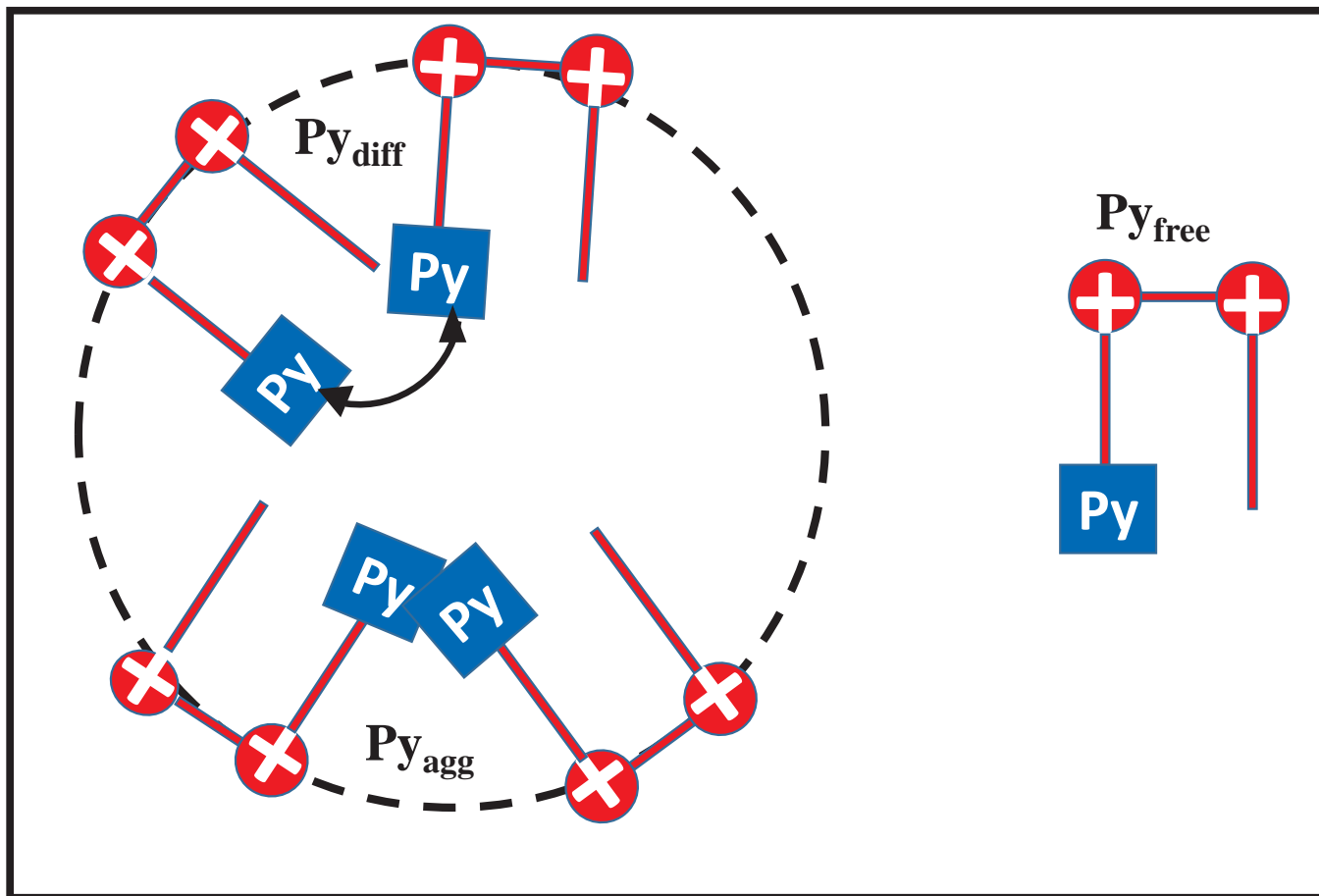
Pyrene Excimer Formation



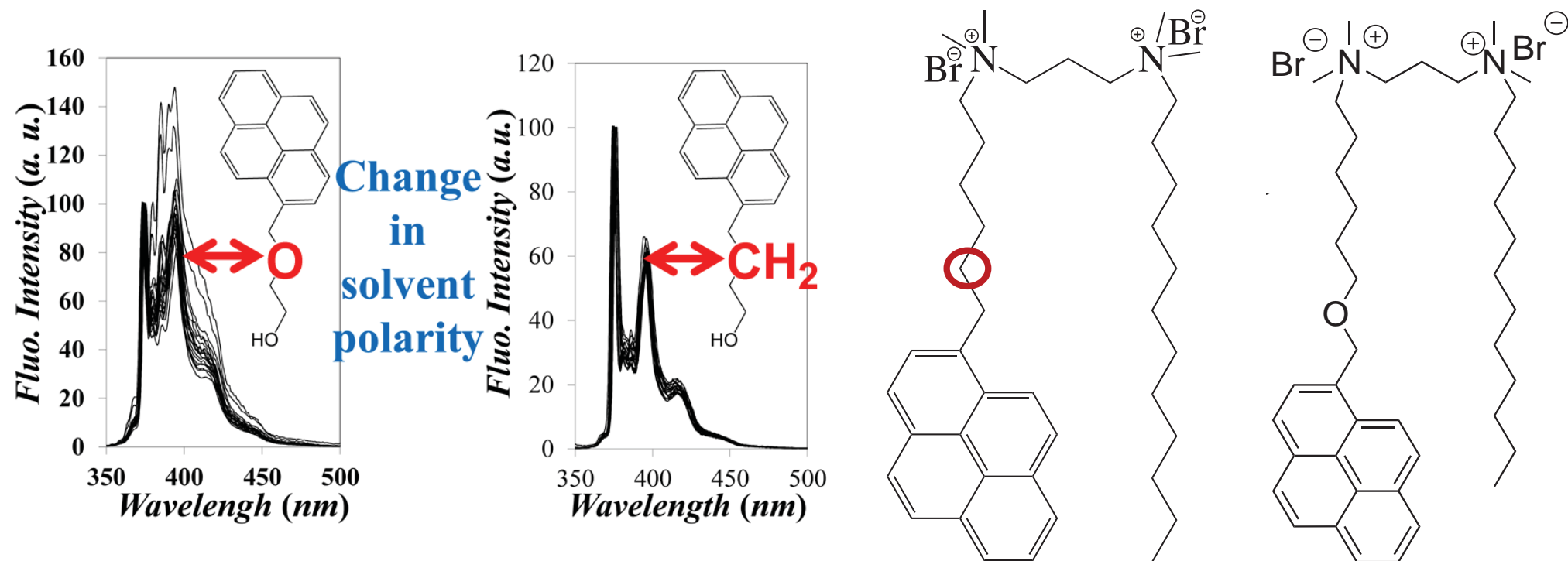
Pyrene Excimer Formation

- I_E/I_M = a measure of the amount of excimer formed.
- From the model free analysis:
 - Py_{free} = Free Py in solution.
 - Py_{diff} = Py forming excimer by diffusion.
 - Py_{agg} = Py forming excimer by aggregation.
 - $\langle k \rangle$ = average rate constant of excimer formation.

Pyrene Excimer Formation



Previous Probe



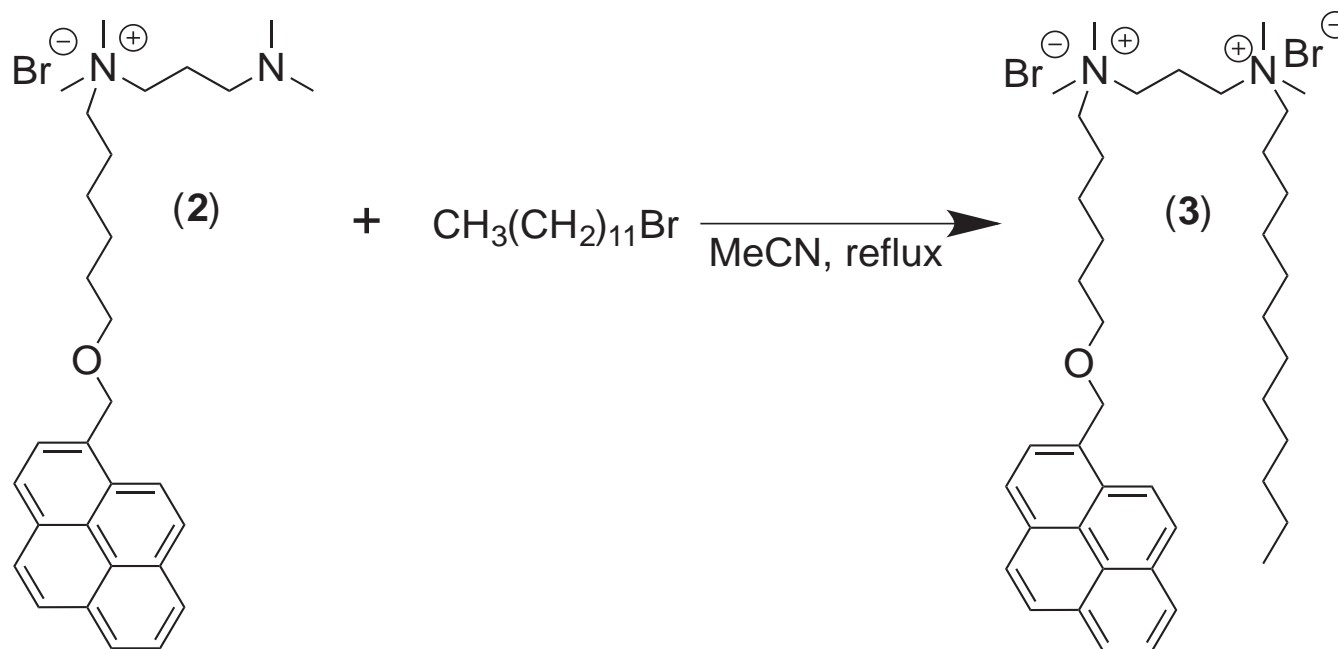
Keyes-Baig, C.; Duhamel, J.; Wettig, S., *Langmuir* **2011**, 27, 3361–3371.

Farhangi, S.; Duhamel, J. *J. Phys. Chem. B*, **2016**, 120, 834–842.

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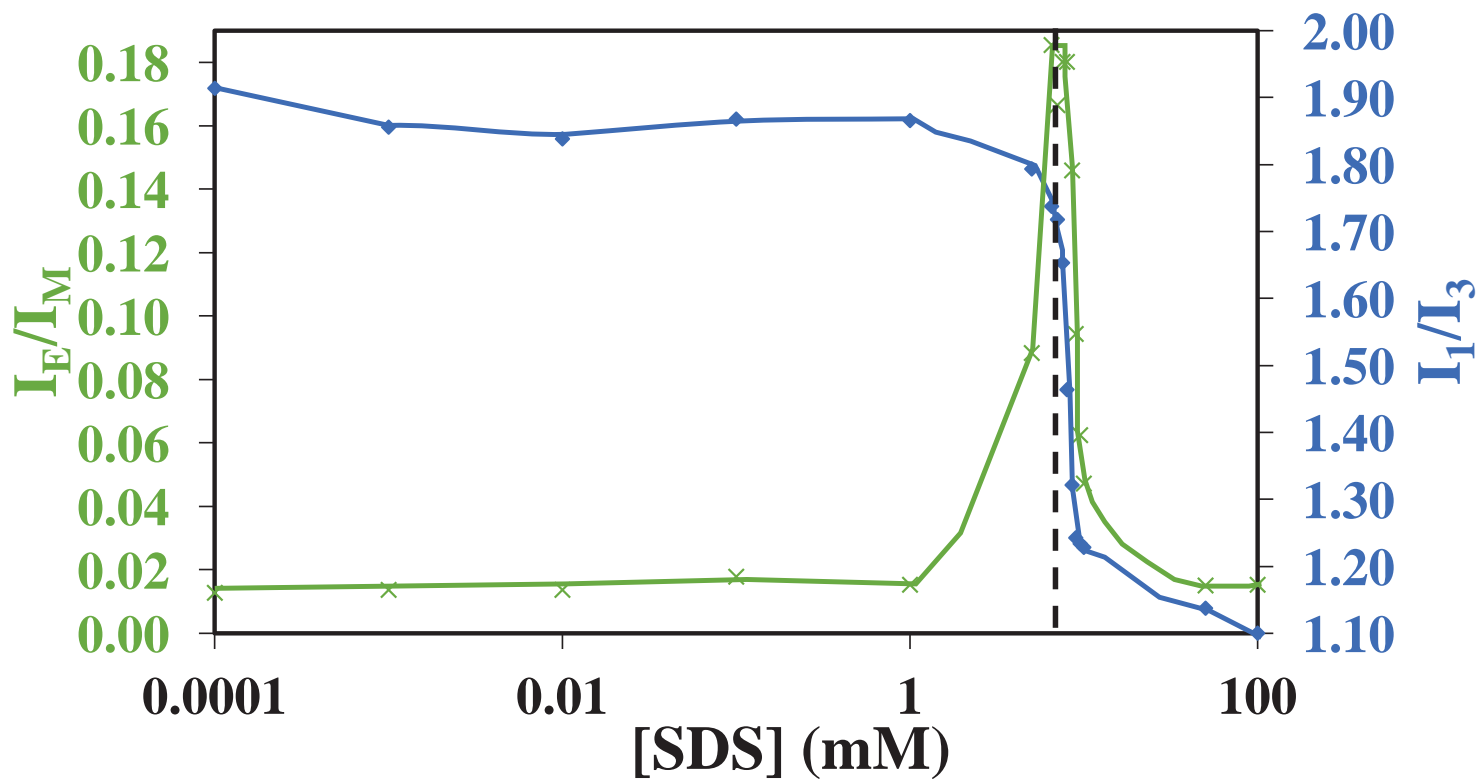
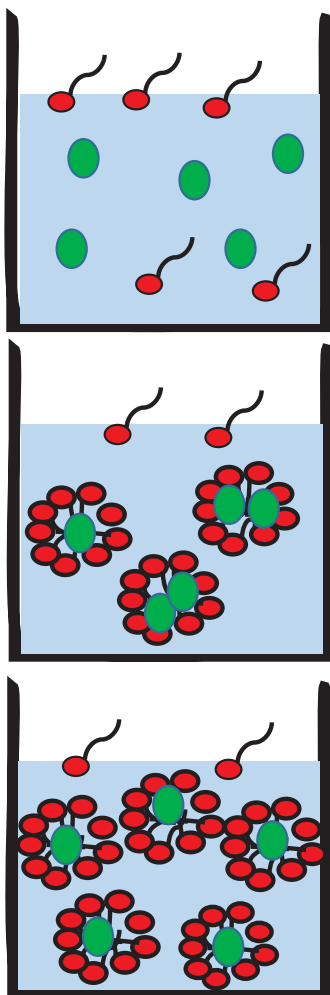
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 - **PyO-3-12 Synthesis**
 - **Interaction with Non-gemini Surfactants**
 - **Py in SDS**
 - **CTAB**
 - **SDS**
- Summary

PyO-3-12 Synthesis



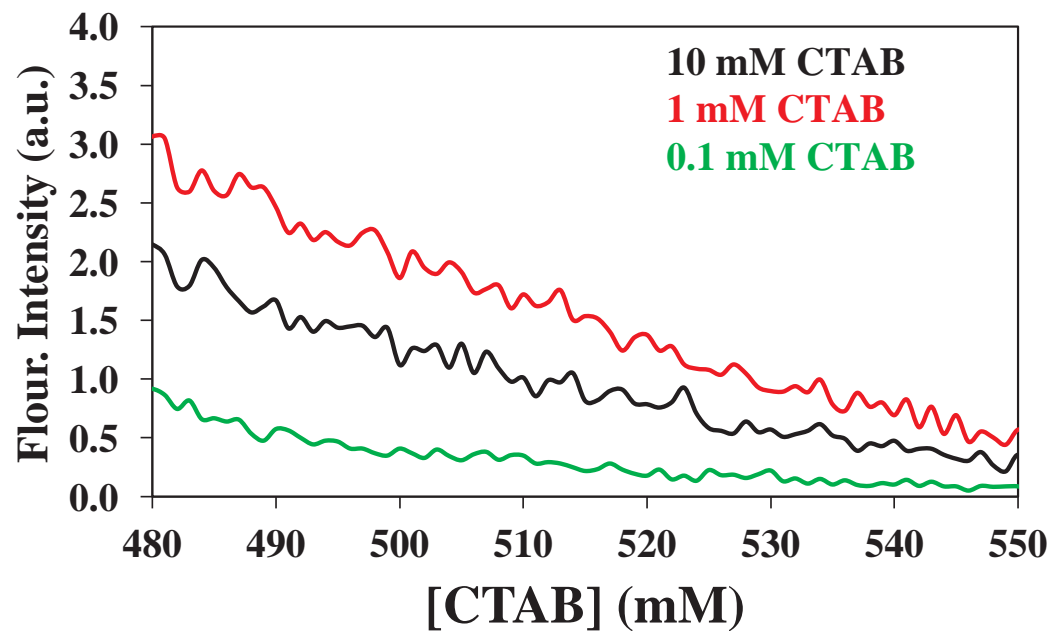
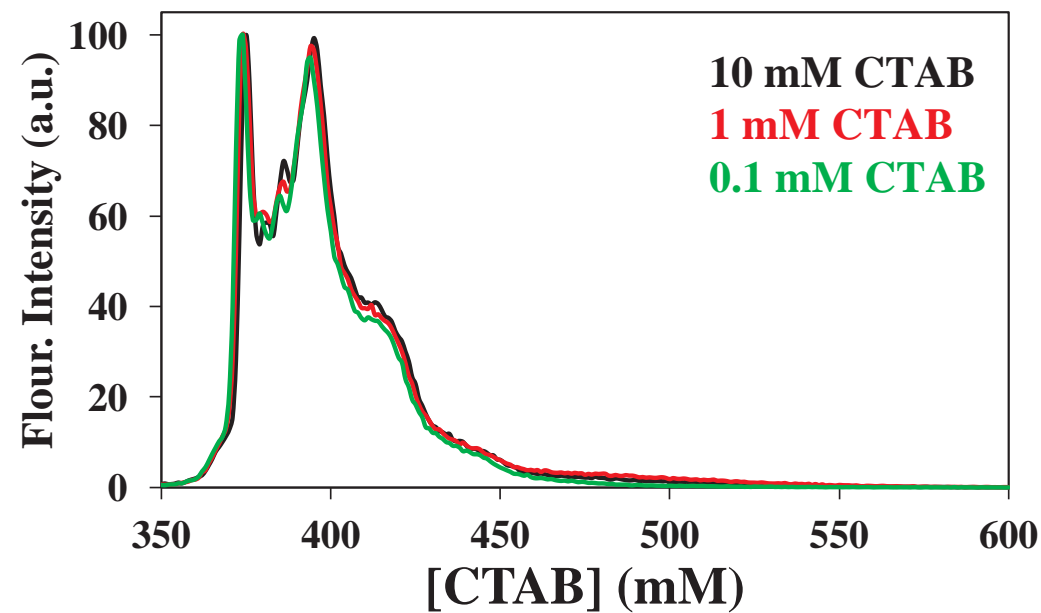
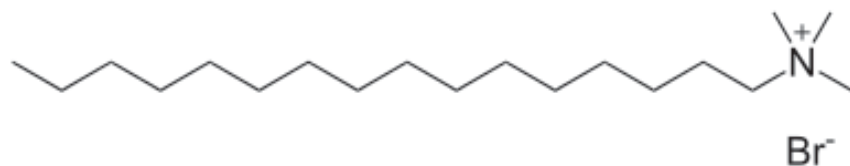
Interaction with Non-gemini Surfactants

Py in SDS



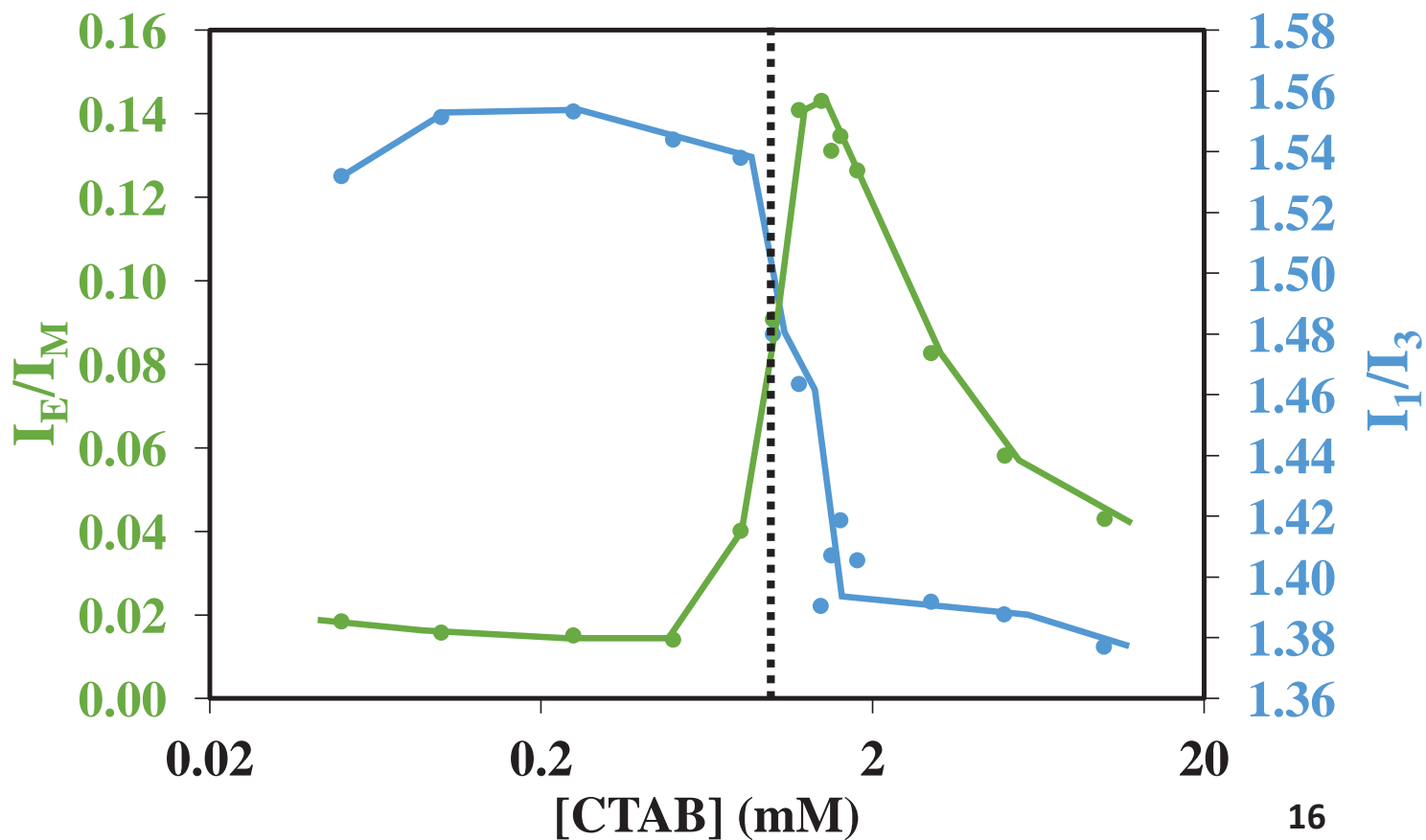
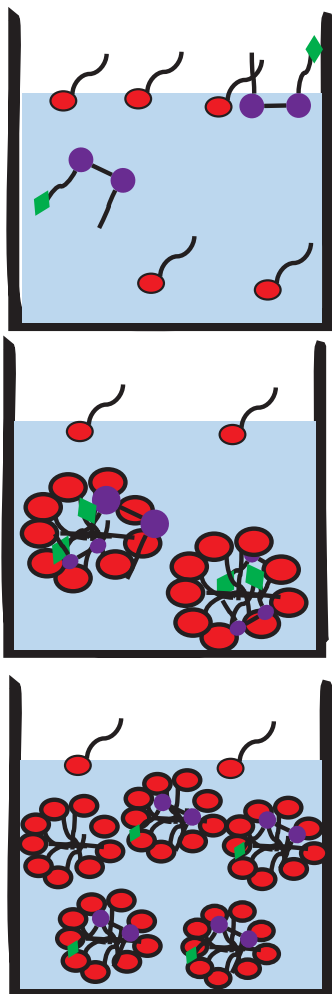
Interaction with Non-gemini Surfactants

CTAB



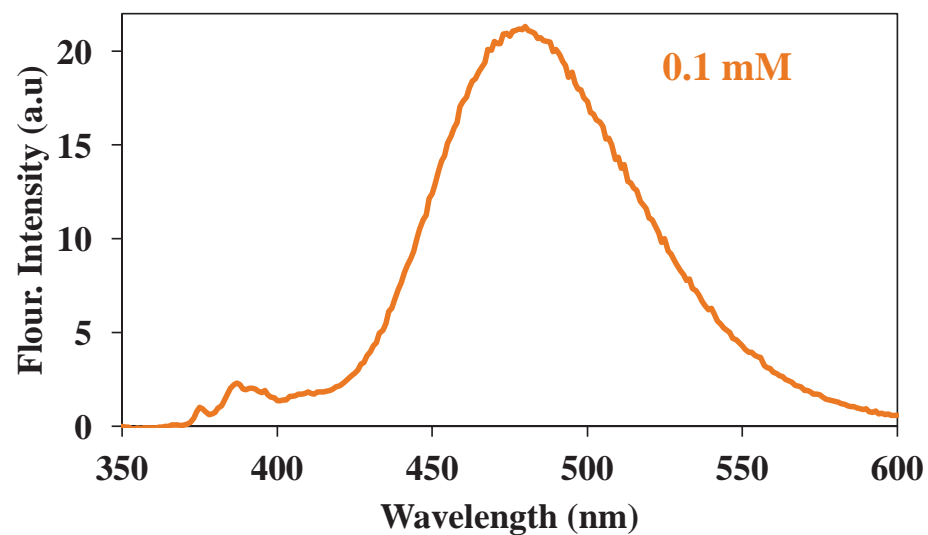
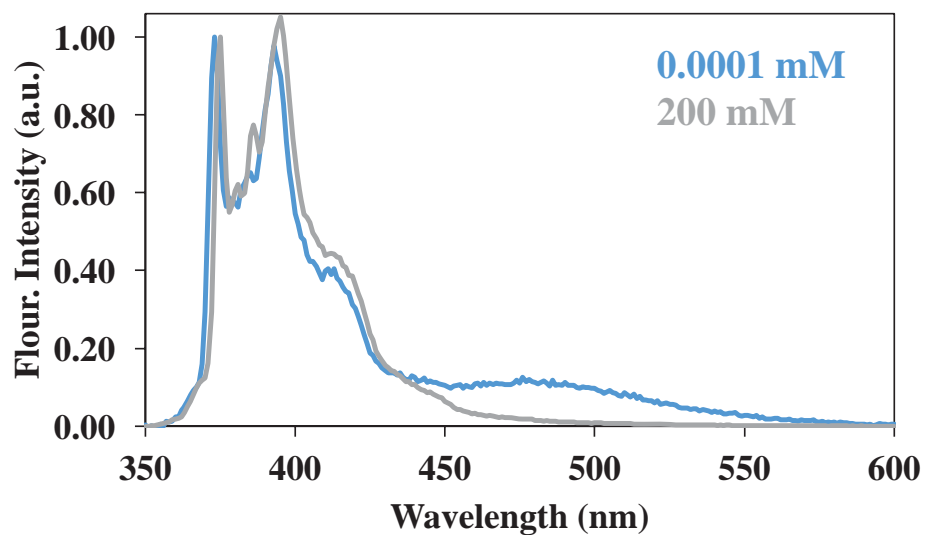
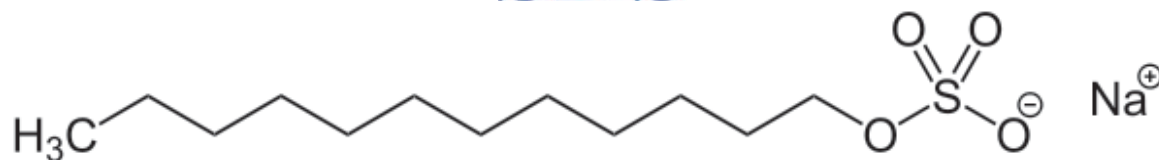
Interaction with Other Charged Surfactants

CTAB



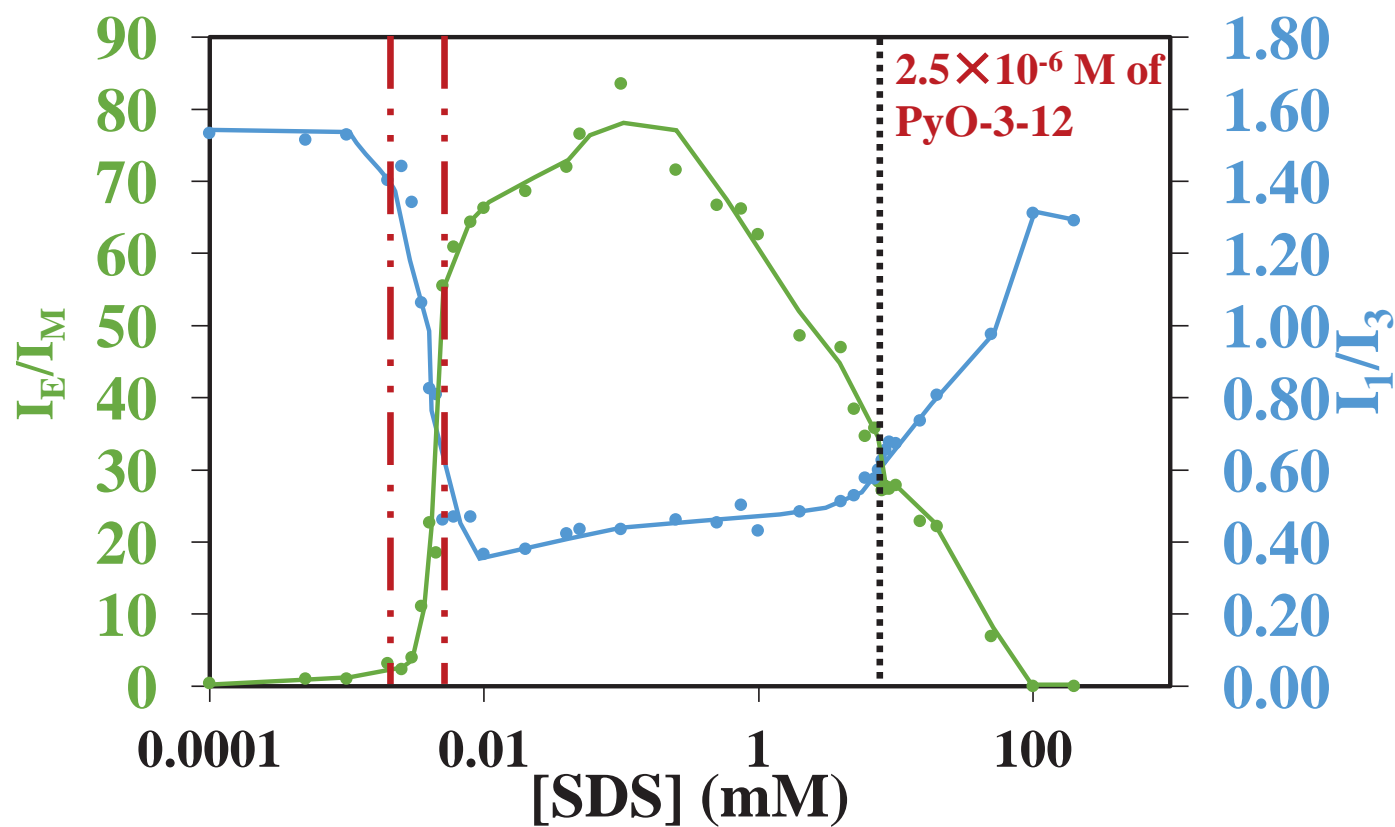
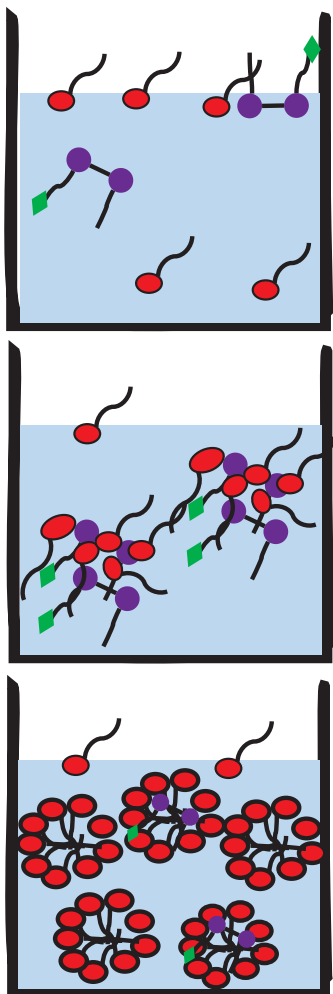
Interaction with Non-gemini Surfactants

SDS



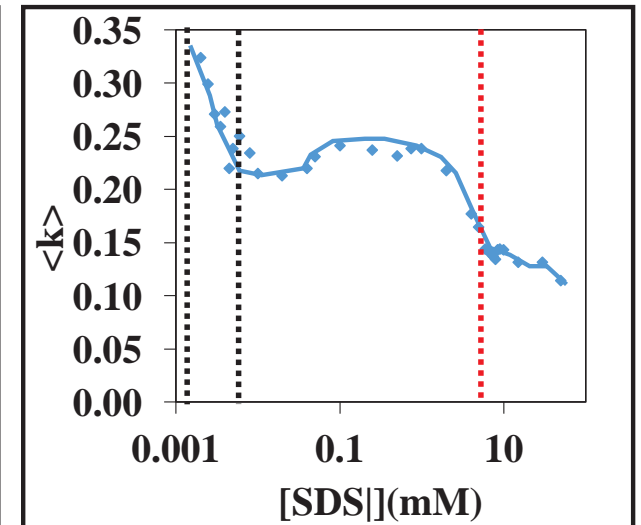
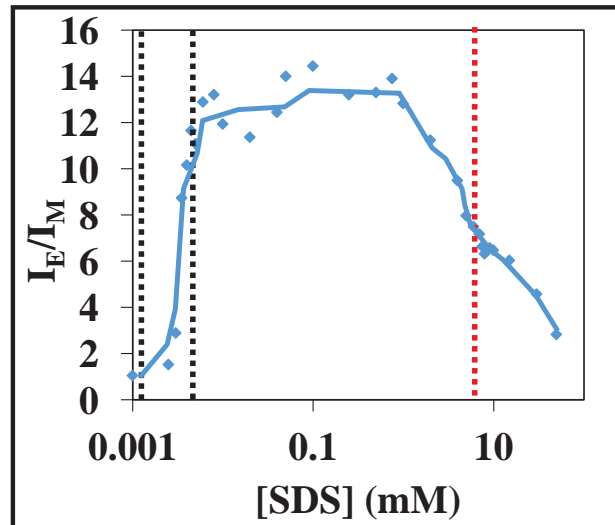
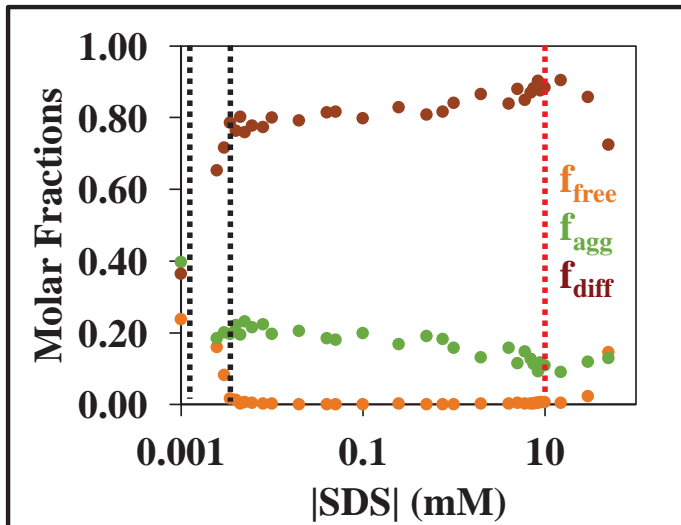
Interaction with Non-gemini Surfactants

SDS



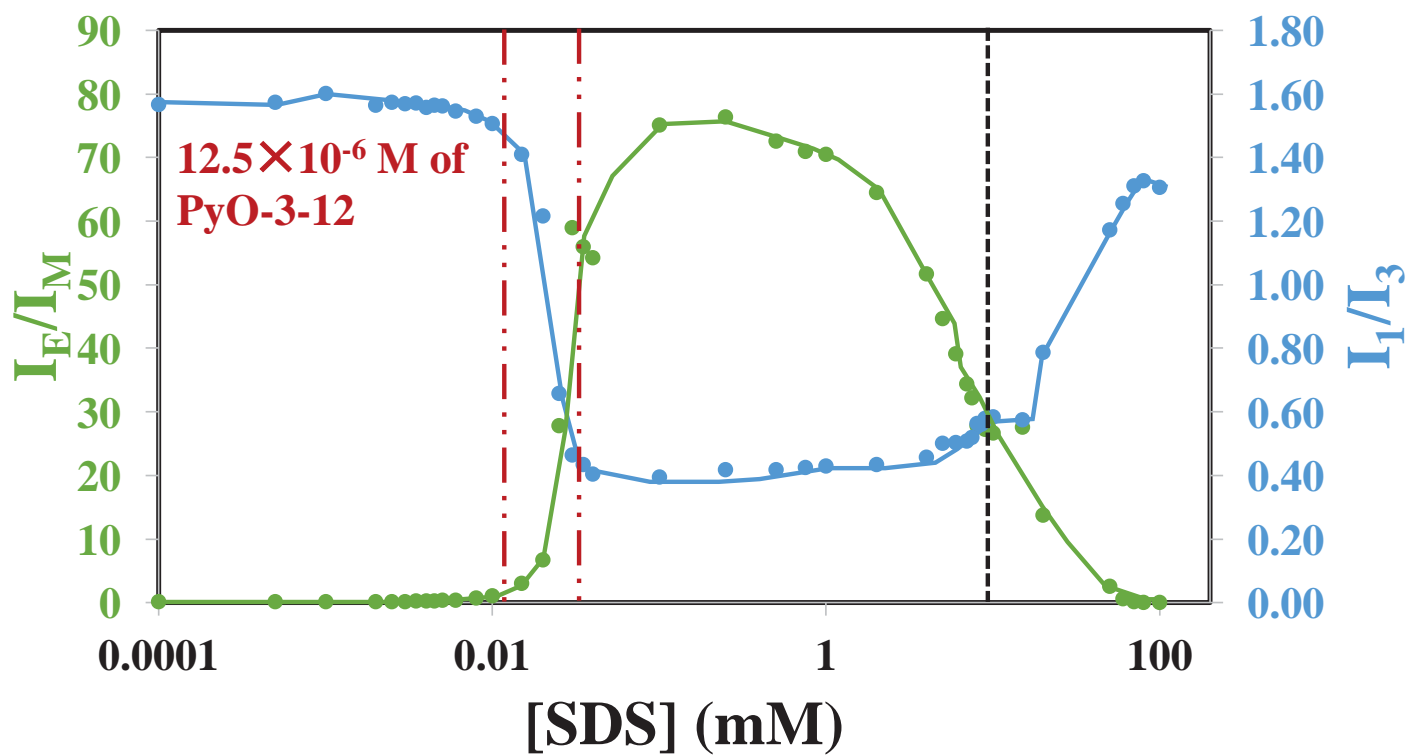
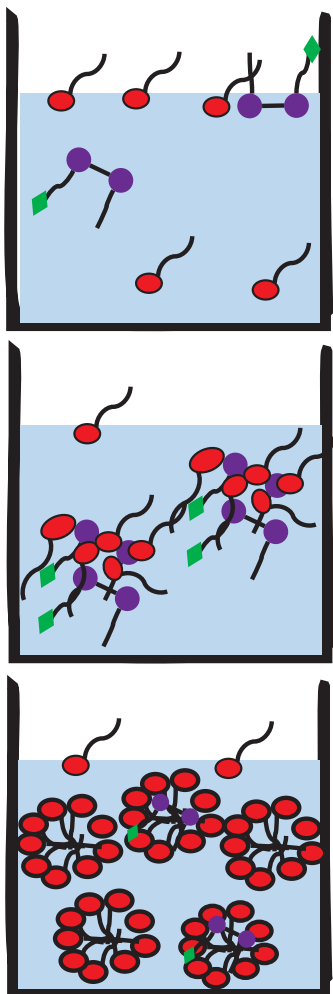
Interaction with Non-gemini Surfactants

SDS



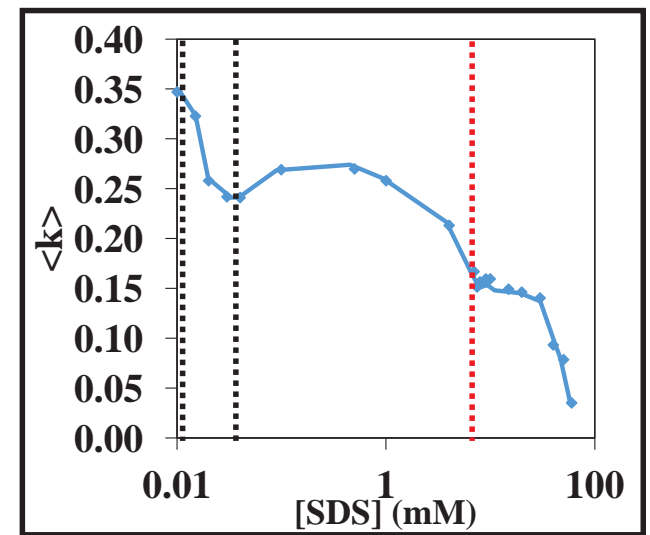
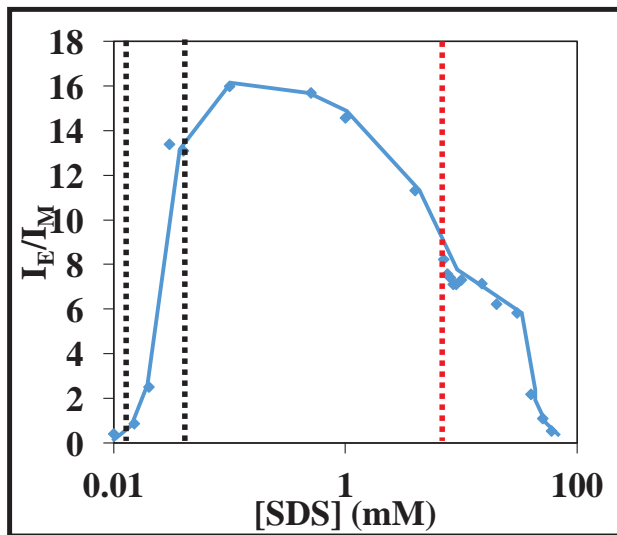
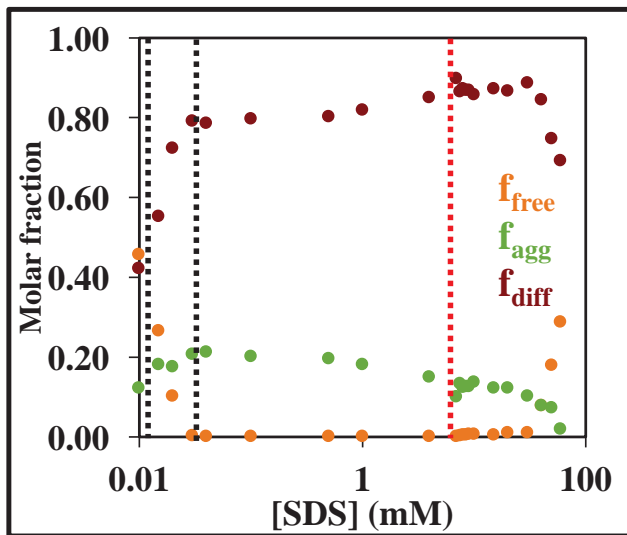
Interaction with Non-gemini Surfactants

SDS



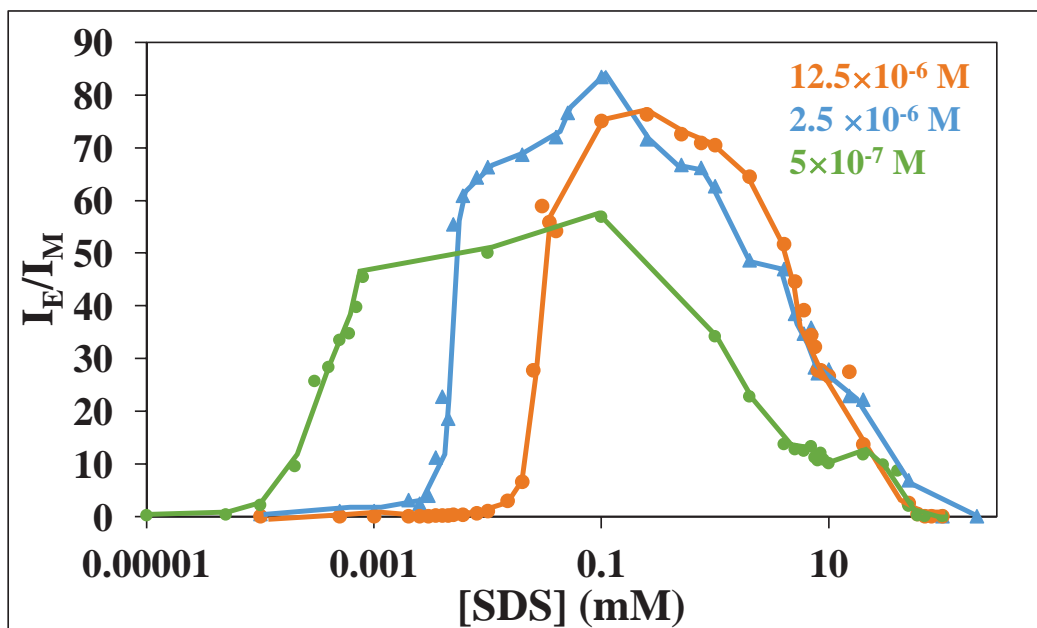
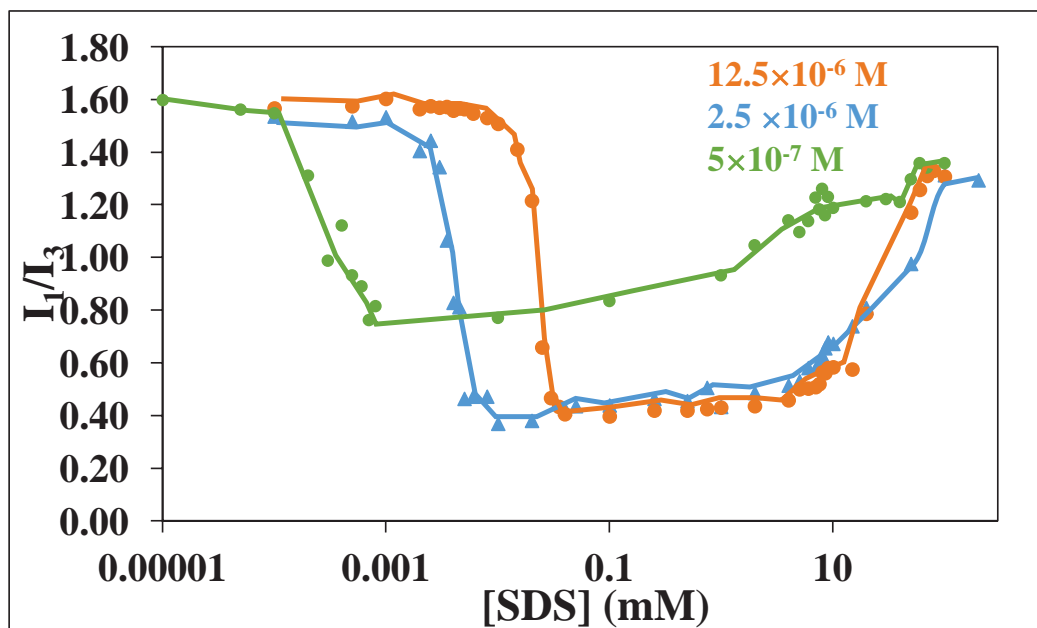
Interaction with Non-gemini Surfactants

SDS



Interaction with Non-gemini Surfactants

SDS



Summary

- The pyrene labeled gemini surfactant PyO-3-12 was successfully synthesized and its ability to probe the local polarity was restored.
- PyO-3-12 interacts normally with CTAB.
- PyO-3-12 forms stable aggregates with SDS due to electrostatic interactions at very low concentrations (0.5 μM).
- This concentration sensitivity can be utilized for detection applications.

Acknowledgments

- Prof. Jean Duhamel
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**NSERC
CRSNG**



Thank You for Your Attention