

UNIVERSITY OF RHODE ISLAND

Department of Chemistry

Ph.D. Seminar

Room 105 Beupre

2:00 P.M., Friday, April 8, 2022

Mara Dubnicka

University of Rhode Island

Department of Chemistry

***“Investigation of rhodamine
fluorophores for use as sensors
in analyte detection”***

HOST

Dugan Hayes

Department of Chemistry

401-874-5516

Investigation of rhodamine fluorophores for use as sensors in analyte detection

Mara Dubnicka
Department of Chemistry
University of Rhode Island

This work focuses on the application of Rh640, Rh700, and Rh800 as sensing fluorophores for use in detection of analytes. The detection of several analytes spanning various functional groups was investigated using optical spectroscopy. We chose the eight analytes used in this work for their varied functional groups and importance in environmental and biological detection.

We first investigated the response of the fluorophores to two select analytes, diethylamine and hydrogen peroxide, in aqueous solution. Rh700 and Rh800 both show promise as “turn-off” sensors in the detection of analytes in aqueous solution. Rh640 showed little response to either analyte. The enhanced responsiveness of the Rh700 and Rh800 dyes when compared to the Rh640 dye is attributed to the increased reactivity of the carbon 9 substituent group on the xanthene dye backbone of the fluorophore.

After observing the changes in aqueous solution, we applied a three-layer sensor to the detection of analytes. In previous work we found that a three-layer sensor system enhances the absorption and emission of samples. Using our three-fluorophore array of Rh640, Rh700, and Rh800, all eight analytes investigated can be differentiated from each other. The Rh640 continued to show lesser response to analytes in thin film samples when compared to the Rh700 and Rh800 fluorophores. Interestingly, a conversion of the nitrile group, on the Rh800 backbone, to a secondary amine is seen in the presence of primary amine analytes. This conversion leads to blue shifting the absorbance and emission spectra.