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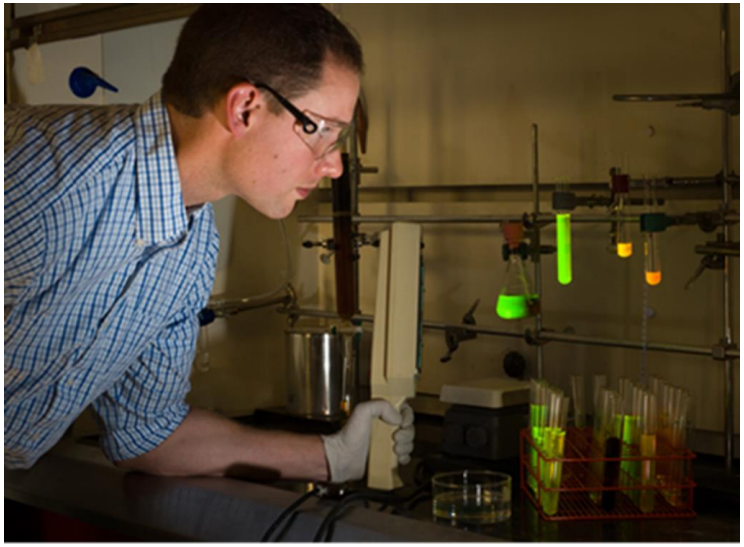
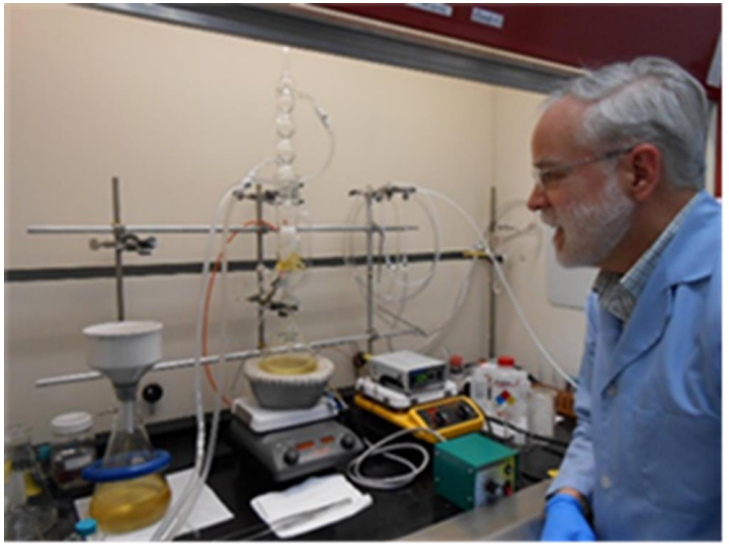
Fluorescent Dyes and Reporters

Akita Innovations

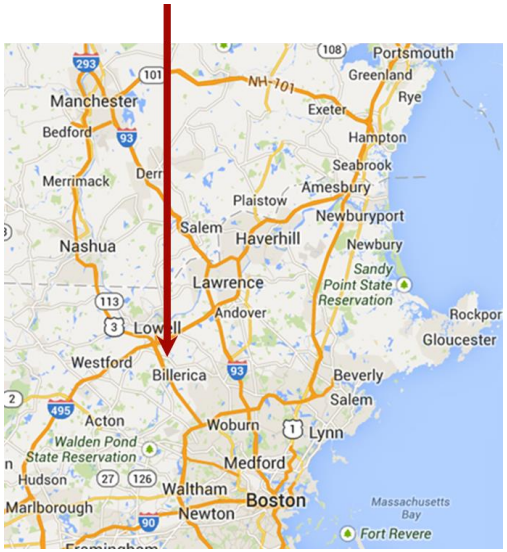


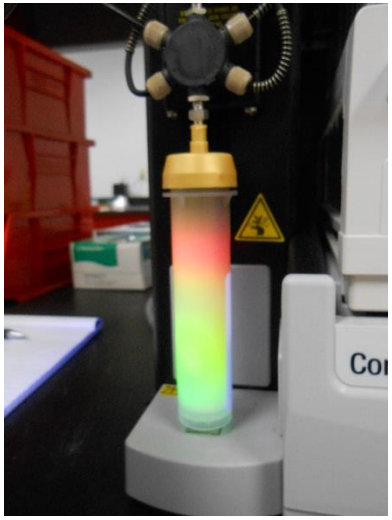


Expertise

Akita Innovations performs research and product development for U.S. government and commercial customers. Akita's expertise includes synthesis of small molecules and polymers, membranes & coatings, chemicals and materials with special optical absorbance and luminescence, as well as chemical and biochemical sensors. We perform scale-up and production from mg to kg levels.

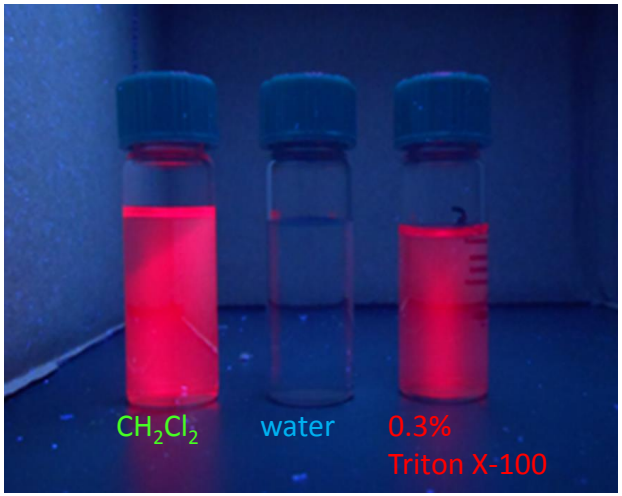
In Billerica, MA; equipped for chemical synthesis and chemical & optical characterization

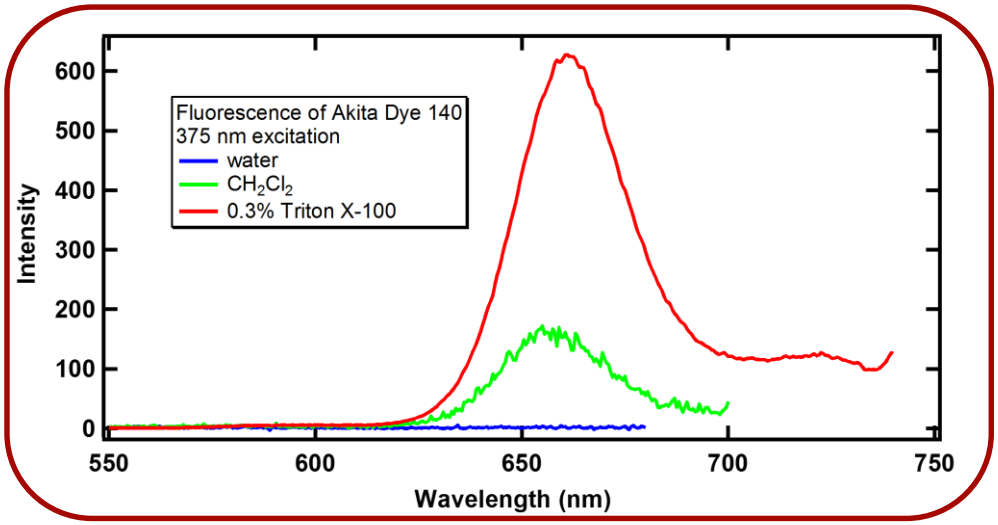


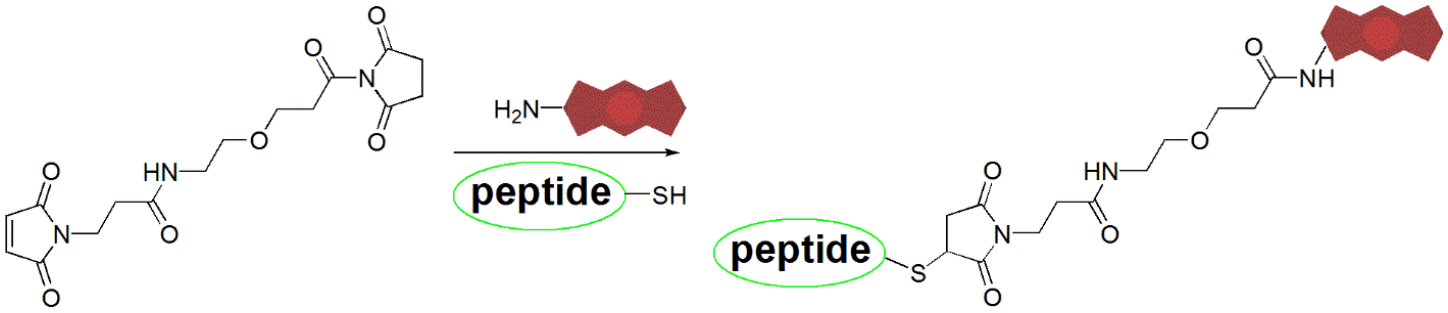


Customers & partners

Absorbing & fluorescing dyes



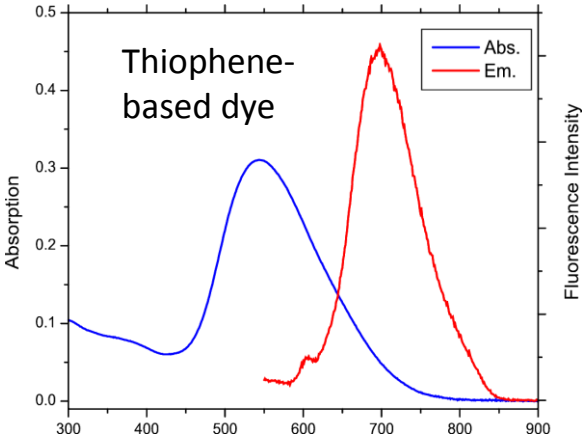


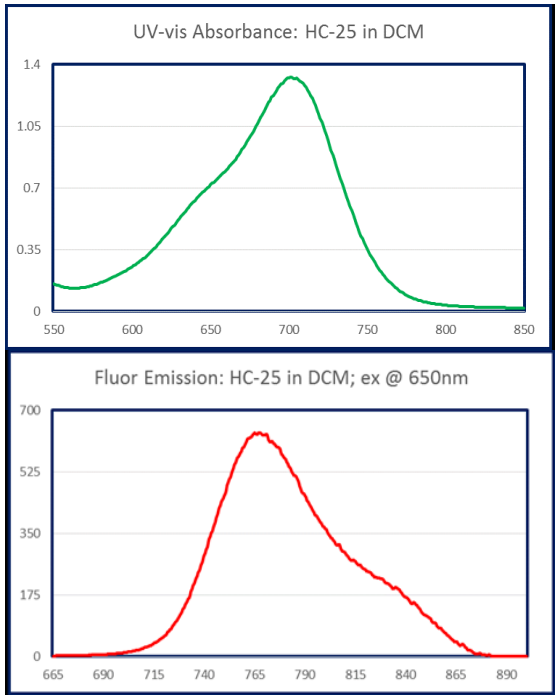


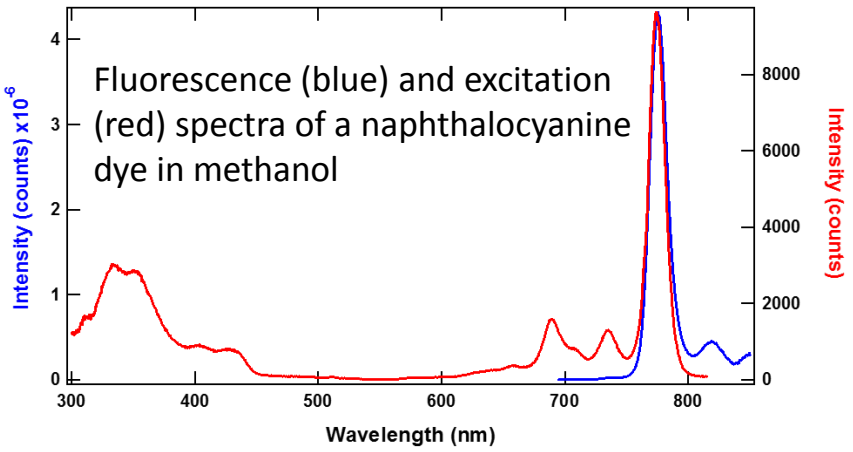
Dyes are organic and organometallic (structures proprietary)

Particular experience with NIR Dyes

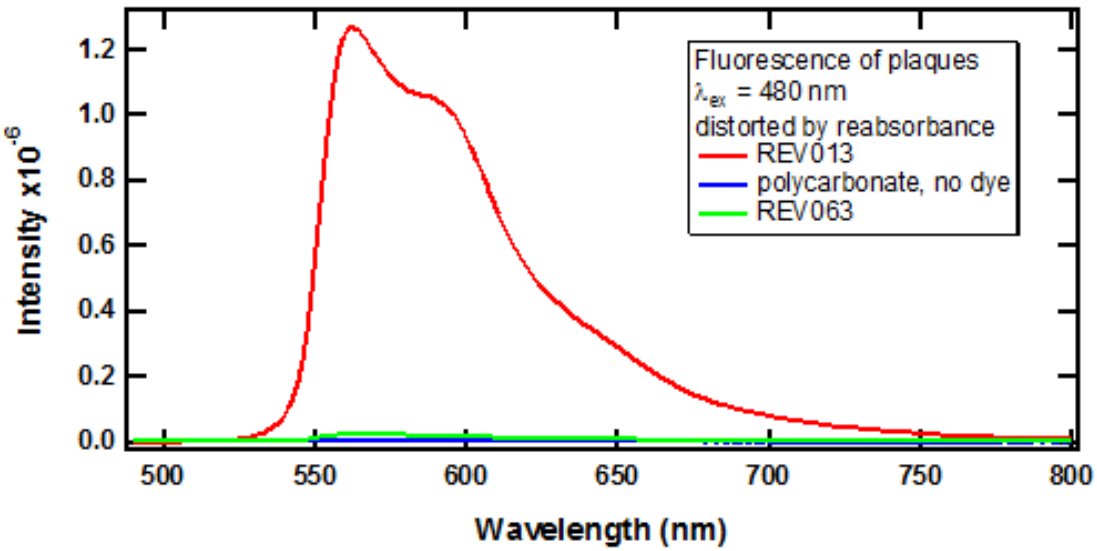
- Emit in ‘physiological window’ in NIR
- Easily excited by powerful, inexpensive NIR lasers
- Low fluorescence yield (energy gap law) an issue
- Large Stoke’s shifts possible, challenging in NIR







Dye modifications to shift, enhance, or quench fluorescence



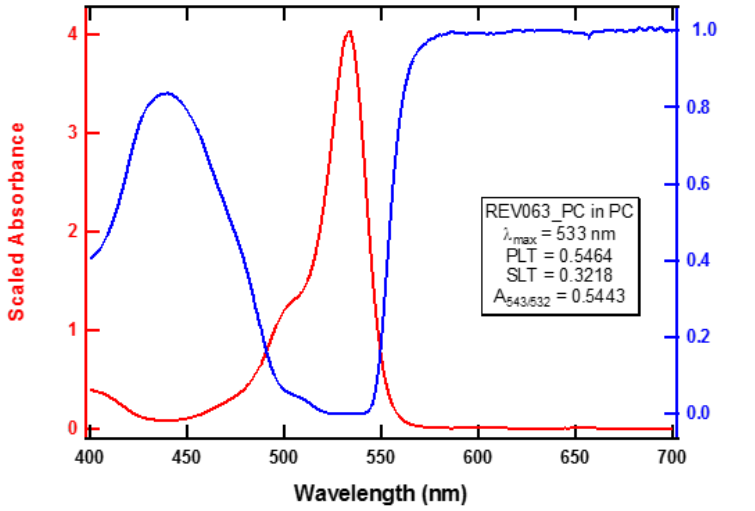
Example of 532 nm absorbing dyes designed for high fluorescence (red) or minimal fluorescence (green), in injection-molded polycarbonate

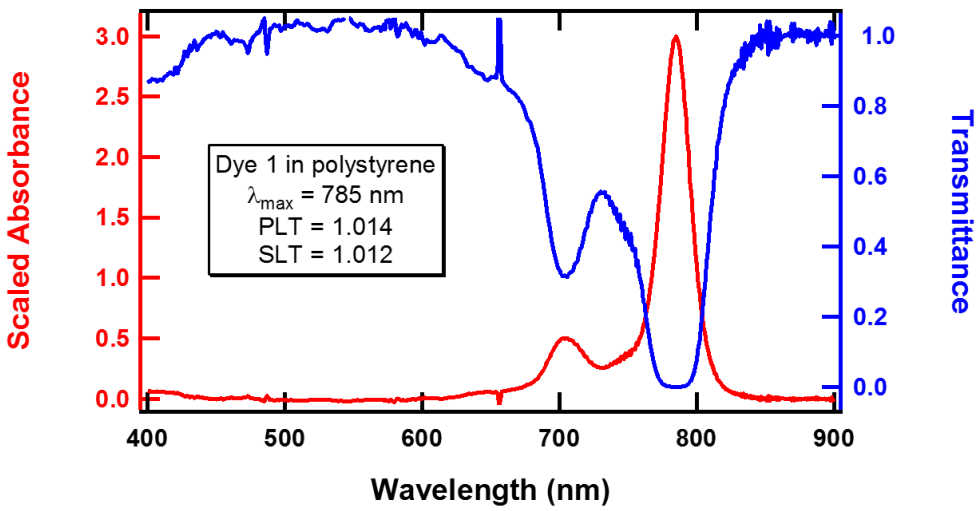
Index #	λ_{max} (nm)
456	800
594	810
638	818
493	830
489	838
669	850
573	861
350	871
582	880
581	890
609	900
428	911
592	918
501	945
335	953

Example narrow-band NIR absorber dye wavelengths

Absorbers (high VLT) also made

Using CIE1931 Illuminant C; PLT is photopic (daytime) transmittance, SLT is scotopic (dark-adjusted eye) transmittance; spectra scaled to 532 nm absorbance of 4.0 (left) or 785 nm absorbance of 3.0 (right)

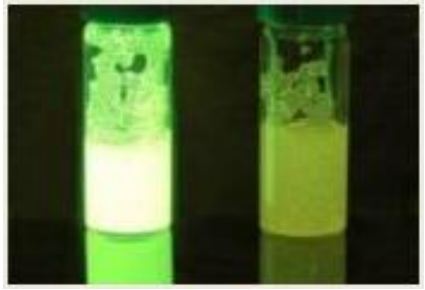


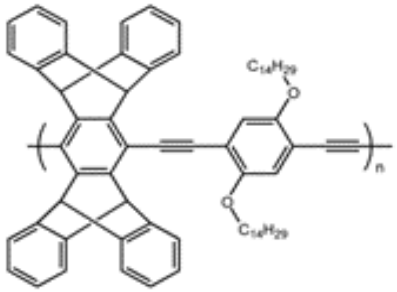


Analyte Sensitive Fluorophores

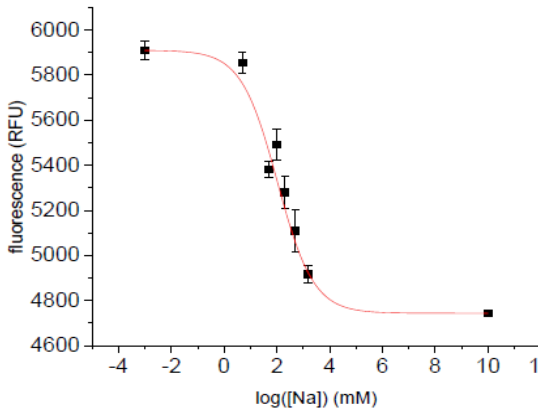
- pH
- Oxygen
- Ions
- Explosives
- Chemical agents

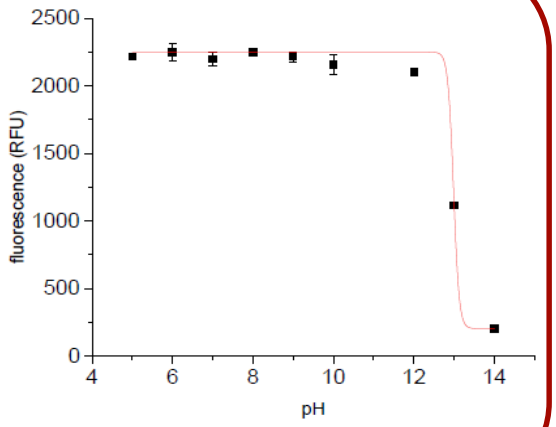
No explosive → with explosive



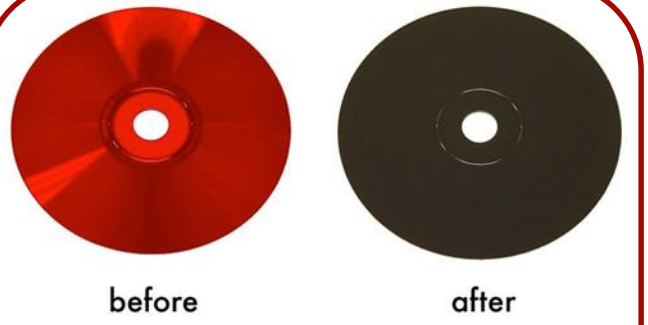


Nitroaromatic explosive-sensitive conjugated polymer manufactured by Akita team (MIT invented, licensed and marketed by FLIR Systems)





Data courtesy of W. Di and Prof. Heather Clark, Northeastern University



DVDs containing oxygen-reactive laser-absorbing dyes
Dye developed by Akita personnel

Dyes in/on media

- Micro/nanospheres (polymer, silica)
- Thin polymer films
- Membranes
- Covalently linked to polymers
- Bulk plastic (injection molded, extruded)