



Carbondale Red

- Silanthracene (Carbondale Red) as Red and Near Infrared Sensors and Probes

Southern Illinois University Carbondale

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Technology Summary

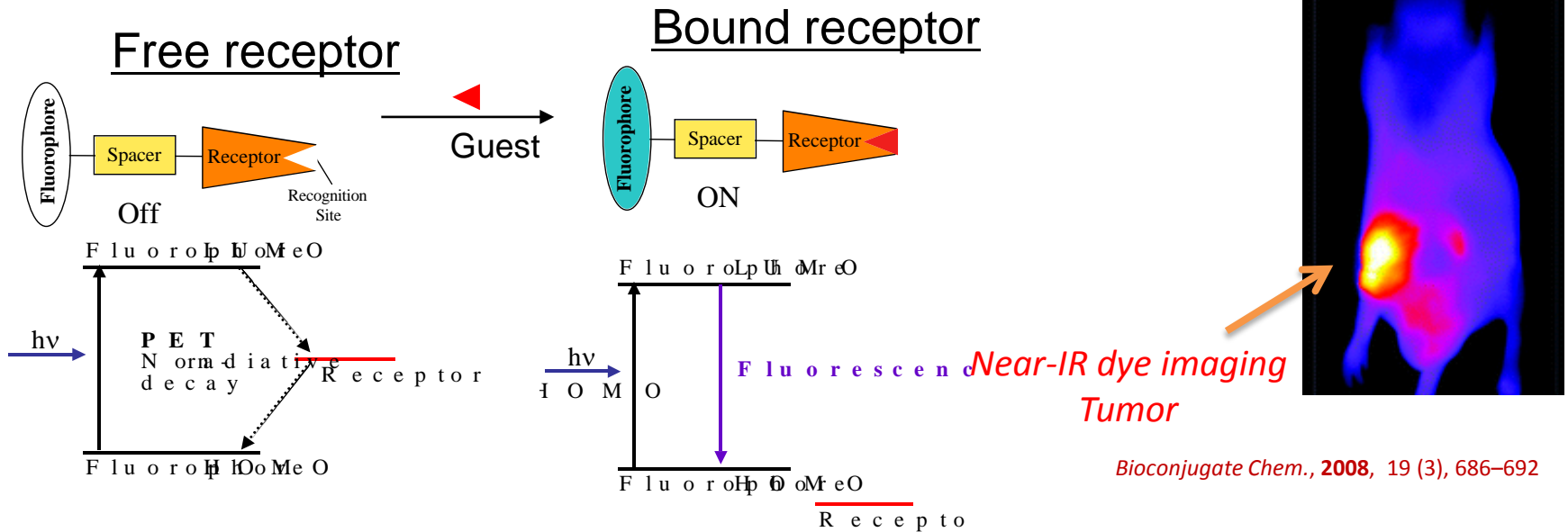
- Our probes can be used to develop devices (sensors) for a variety of applications, including biological (e.g. Cellular imaging and monitoring biological analytes such as glucose), and non-biological (e.g. Dye tracing and monitoring non-biological analytes such as pH).
- Developed by:
 - Daniel Dyer/Professor/SIUC/Chem. & Biochem. (Deceased)
 - Colleen Scott/Assistant Professor/SIUC/Chem. & Biochem.
 - Matthew McCarroll/Associate Professor/SIUC/Chem. & Biochem.
 - Lichang Wang/Professor/SIUC/Chem. & Biochem.
 - Quinn Best/Student/SIUC/Chem. & Biochem.
 - Narsimha Sattennapally/Student/SIUC/Chem. & Biochem.

Technology Summary

- Fluorescence Microscopy – a very important applications in the biomedical field which is also in high demand.
- in vivo Imaging - Non-invasive visible light imaging is now a widely accepted technology allowing researchers to follow many biological processes in healthy and diseased animal models.
- Flow Cytometry – technique for counting and examining microscopic particles, such as cells and chromosomes.
- Fluorescence Correlation Spectroscopy – a correlation analysis of fluctuation of the fluorescence intensity.
- Enzyme-linked Immunosorbent Assay (ELISA) – is a biochemical technique used mainly in immunology to detect the presence of an antibody or an antigen in a sample.
- Dye Tracing – is tracking and tracing various flows using dye added to the liquid in question.

Possibility of licensing to Molecular Probes (target) or other companies in the field.

Technology Details



Binding alters the energy of the frontier MO's!

Key Aspect for Imaging

Longer wavelengths are better for in vivo imaging

- Less light scattering
- Few biological molecules absorb/fluoresce
- Deeper penetration in tissue
- Optical window (650-900 nm)

Technology Details

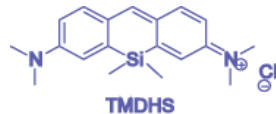
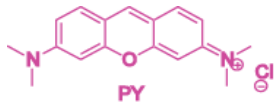
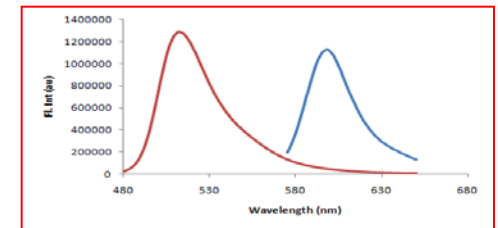
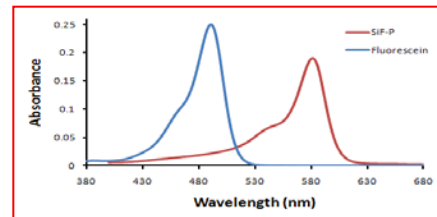
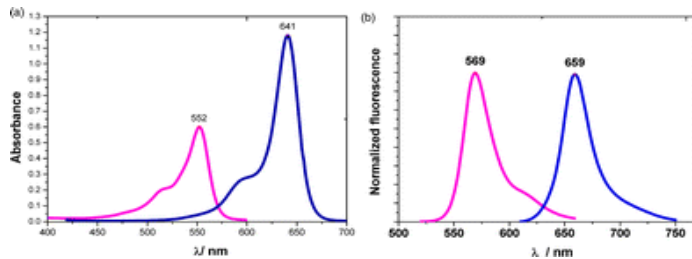
rhodamine core

fluorescein core



Fluorescein
 $\lambda_{\max} = 493 \text{ nm}$

SiF-P
 $\lambda_{\max} = 584 \text{ nm}$



Exc – 552 nm
Em – 569 nm

Exc – 641 nm
Em – 669 nm

Exc – 494 nm
Em – 521 nm

Exc – 580 nm
Em – 596 nm

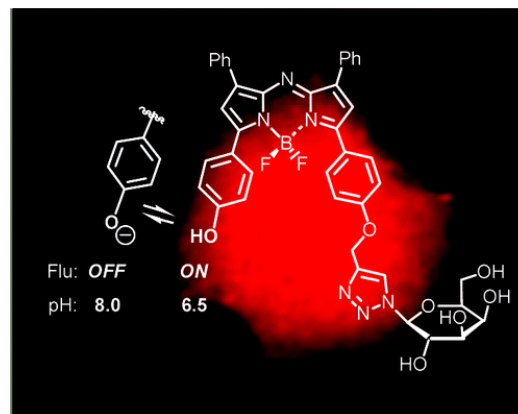
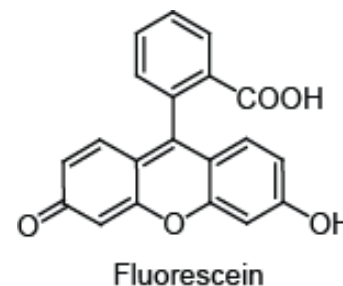
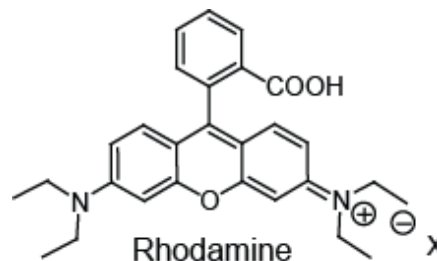
11.5 μM in CH_2Cl_2

Chem. Commun., **2008**, 1780–1782

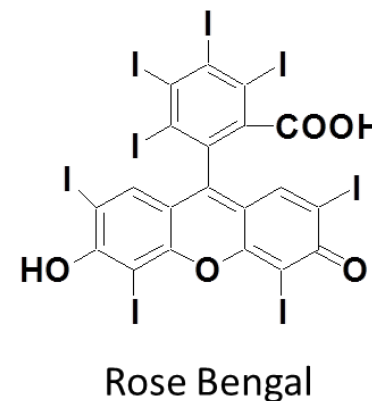
The Competition

Rhodamine and Fluorescein

- High absorptivity and quantum yield
- Resistant to photo-bleaching
- Water Soluble
- Used in biological studies
 - Fluorescent Stain/Label
 - Fluorescence Probes/Sensors
- Rhodamine not FDA approved
 - Known mutagen
 - Targets mitochondria
- Fluorescein FDA approved
 - Ophthalmology
 - Fluorescein derivative Rose Bengal has high $^1\text{O}_2$ yield
 - Rose Bengal lacks specificity for cancer cells

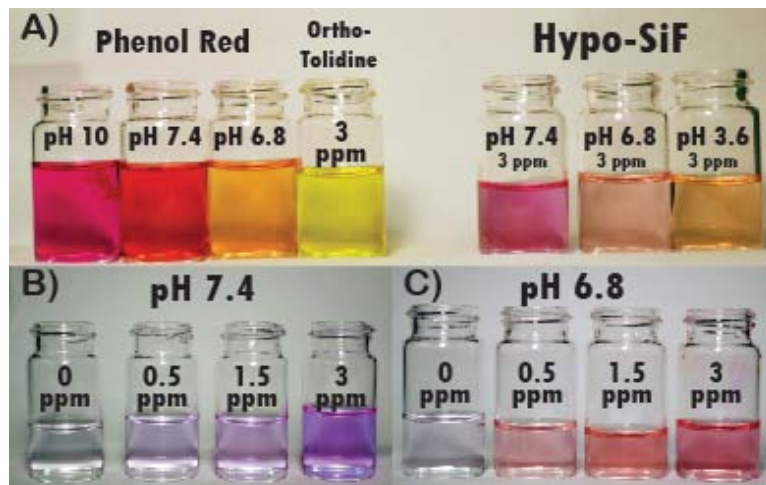
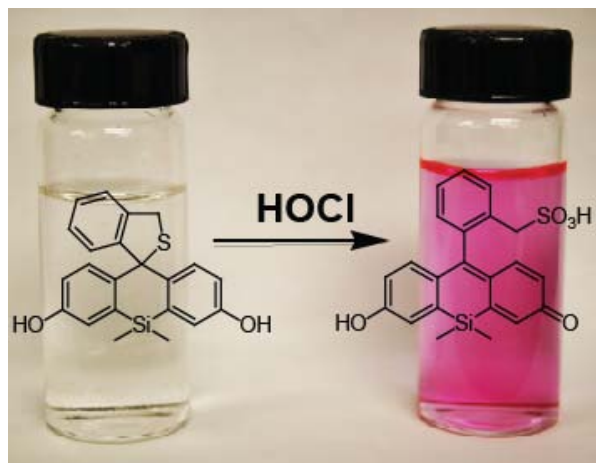


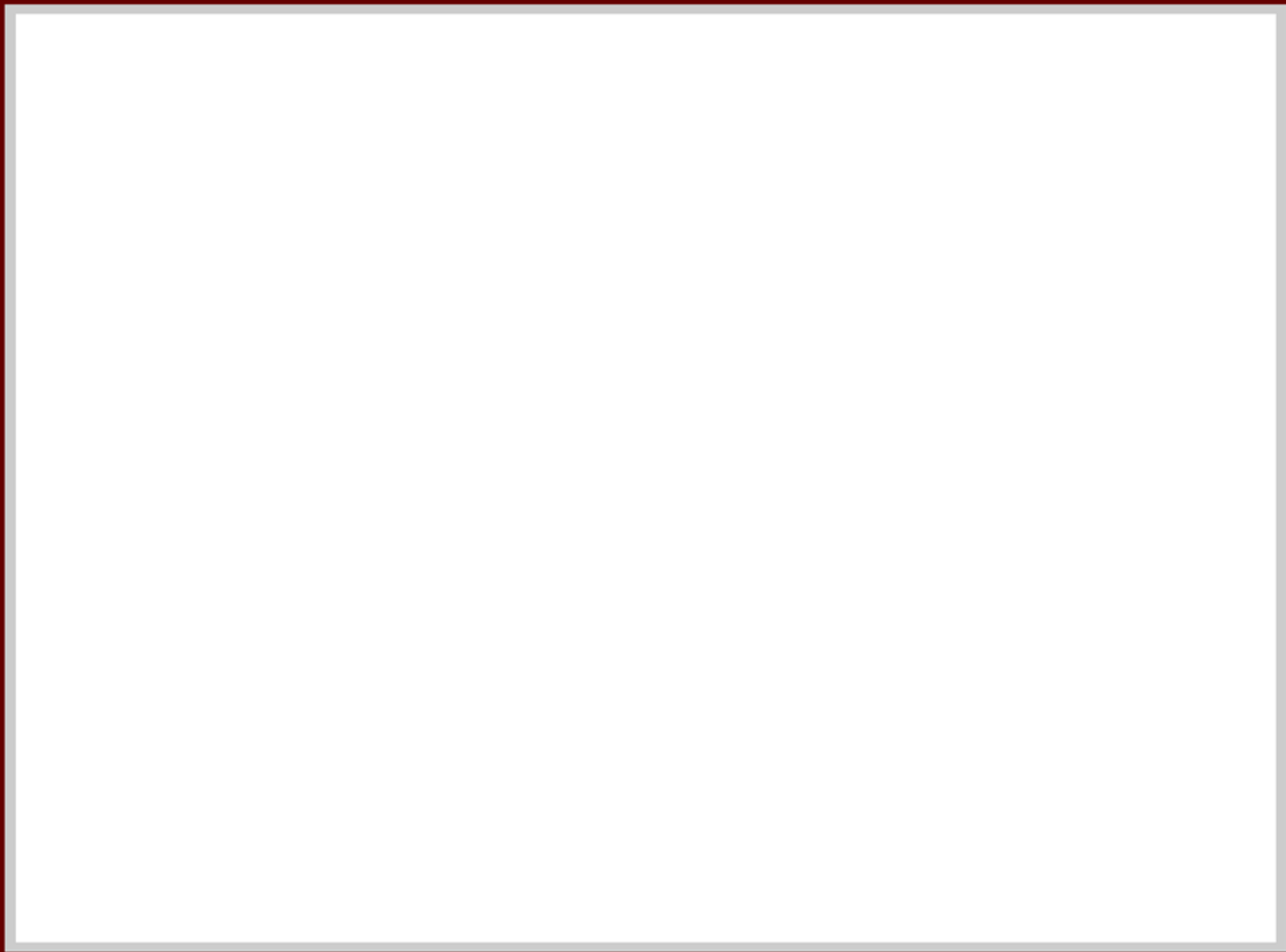
Photodynamic therapy

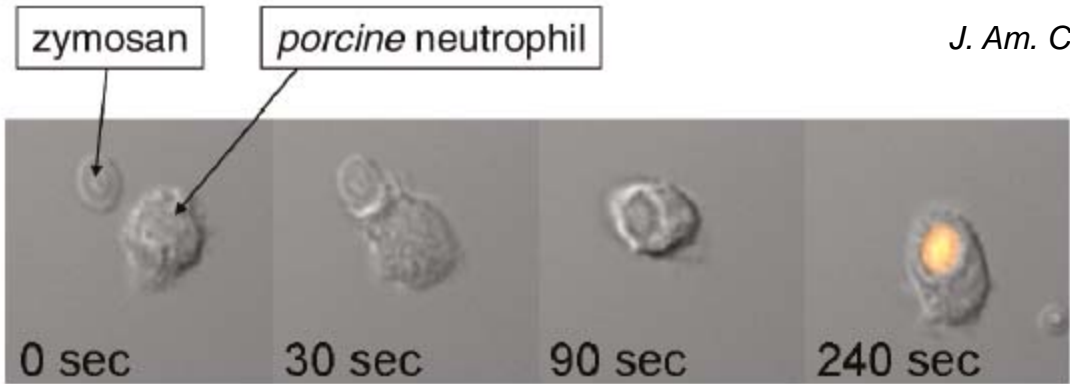


Current Developmental Status

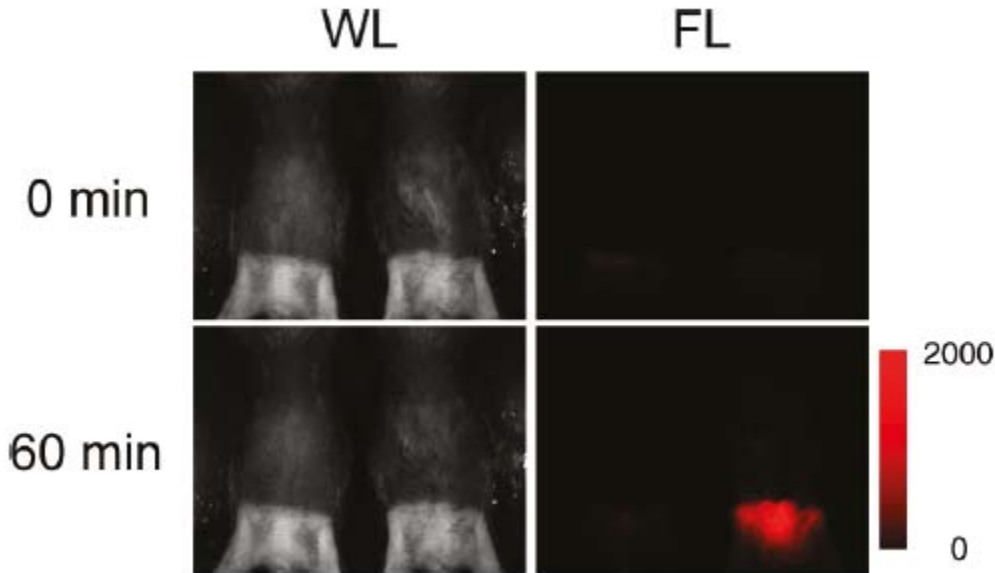
- Progress to date
 - Synthesized a series of probes and analyzed their luminescent properties – the properties are comparable to rhodamine and fluorescein
 - Developed a dual probe for HOCl and pH
 - Perform initial toxicology experiments
 - Developing probe for photodynamic therapy treatment







Fluorescence microscopic imaging of phagocytosis



Peritonitis is a bacterial or fungal infection of the peritoneum, a silk-like membrane that lines your inner abdominal wall and covers the organs within your abdomen.

Comparison of white light (WL) and 750 nm fluorescence (FL) images of unstimulated mouse (left) and the peritonitis model mouse stimulated with zymosan and PMA (right).

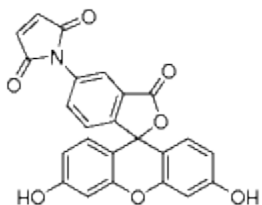
Current Developmental Status

Developmental hurdles -

- Collaborators - expertise to perform necessary biological studies (cellular imaging, advance toxicology studies, etc.)
- Funds to perform the biological studies \$\$\$
- Manpower – fulltime graduate students \$\$\$
 - 3 fulltime graduate students for 1 year ~ \$63,000
- Ideally – patent and license or sell patent

Technology Market

- The potential market for the biological applications – Huge!!!
 - These fluorescent probes are in high demand but a low supply; therefore, existing probes are extremely expensive .
 - **Invitrogen: APF (hydroxyl radical, hypochlorite or peroxynitrite sensor) Cat. No. A36003 Unit Size 470 μ l Price (USD) 366.00**
 - **Alexa Fluor® 633 carboxylic acid, succinimidyl ester, 1 . Cat. No. A-20005 Unit Size 1 mg Price (USD)248.00**



N-(5-Fluoresceinyl)maleimide

38132-25MG \$177.00

Cost 25 mg? *Priceless!!*

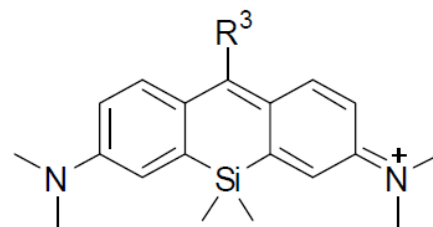
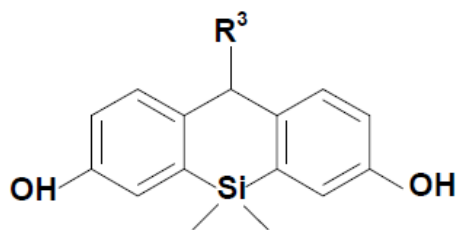
Technology Opportunities

- Fluorescence Microscopy – using the probes to detect and study cellular processes. This is important to studying diseases, cellular mechanisms or a variety of cellular functions.
- in vivo Imaging – can be used to image tumor or other organs. Also can be used to study biological processes in healthy and diseased animal models.
- Our dyes will be an improvement to our competition and an addition to the current long wavelength dyes (few) on the market.
- Our dyes can be applied to any biological species. Can also be used for non-biological functions (pool kit).
- Target – Molecular probes (biological functions)

Intellectual Property Protection

- U.S. Provisional Patent Application Serial No. 61/423,974
- Filed: December 16, 2010
- Entitled: SILAANTHRACENE AS A RED AND NEAR INFRARED SENSOR AND A METHOD TO MANUFACTURE SUCH A SENSOR
- Our Ref.: 052001-422116

Claims



Carbondale Red

- For more information:

- Call or email

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Questions?