



TECH TO BUSINESS

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High Stokes Shift Fluorescent Dyes for Biological Imaging

TECH ID #: 234.8

Background

Researchers at the University of Calgary have created a new family of dyes with large Stokes shift and solvatochromic properties. A larger Stokes shift eliminates spectral overlap between absorption and emission and allows detection of fluorescence while reducing interference. This also eliminates quenching of the fluorescence and gives a stronger signal when used for biological imaging. Solvatochromism is a property of the dyes which lends them to chemical characterization and sensing applications; the dyes have the advantage of differentiating between solvent polarities which is useful for labelling cell membranes, protein binding sites, and liposomes.

Fluorescence microscopy and biological imaging are rapidly expanding research areas and completely dependable on newer, more efficient fluorescent dyes. This requires more sensitive and specific dyes with larger Stokes shifts, increased stabilities and acceptable quantum yields. The common BODIPY dyes are widely used but have the disadvantage of short Stokes shifts (8–50nm). The newly formed dyes have a lower molecular symmetry to BODIPY and possess different chemical properties. The resulting functional differences of the new dyes in comparison to other dyes are: a large Stokes shift of approximately 100 nm, fluorescence life time up to 11.1 ns, quantum yields up to 0.75 depending on the dye, photo-stability in aqueous and organic solutions, and solvatochromism. The structures of the new compounds are highly stable and allow for cheap and efficient synthesis.

Areas of Application

- Fluorescence in biological imaging
- Fluorescence lifetime assays
- Flow cytometry
- *In vitro* studies for detection of proteins, nucleic acids, other biological macromolecules; and potential for *in vivo* studies
- Multiplexing of dyes and potential application in FRET-based systems



Competitive Advantages

- Large Stokes shift and high quantum yield
- Dye stability
- Solvatochromism
- Inexpensive and efficient synthesis

Stage of Development

- A number of new dyes have been synthesized and structurally verified and fluorescence properties have been experimentally validated
- Dyes are currently being tested for liposome labelling applications

Intellectual Property Status

- Patent pending