

# DUAL LIGHT-EMITTING SYSTEMS AND BIOLOGICAL APPLICATIONS THEREOF

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**Background:** Near Infrared (NIR) fluorescence can be highly useful in biological systems as it is highly sensitive and allows for detection and imaging of physiological and molecular processes in cells and living organisms. However, radiometric imaging is difficult in the NIR region of the light spectrum without the use of a second dye molecule, and imaging of molecular events is not feasible with single dye molecules, requiring the assembly of two or more fluorophores to monitor molecular interactions. Also, longitudinal tracking of biological processes is limited by erratic signal fluctuations. Molecules exhibiting dual fluorescence emissions can overcome these limitations of existing probes. Newly discovered cyanine dyes have been shown to produce dual fluorescence emissions in the NIR region of the spectrum. Both fluorescence intensities and lifetimes not subject to perturbations by the environment. These properties, as well as other features of NIR dual fluorescent molecules, provide unique opportunities to develop NIR dichromic probes for biological applications.

**Technology Description:** It is based on the discovery that structural asymmetry of NIR cyanine dyes favors the generation of dual fluorescence emissions. An important feature of these molecules is the ability to alter the ratios of the two fluorescence bands in response to biological events. In addition to fluorescence intensity ratio, the fluorescence lifetimes of the two peaks are also distinct, thereby providing a unique opportunity to multiplex the information content. The various applications for these molecules: DNA and RNA detection and targeting, detection and monitoring of enzyme activity, radiometric imaging of molecular processes in cell and tissues.

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