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Economic syntheses of push-pull fluorene probes using air-stable Pd catalytic systems: Applications into imaging of lipid membranes

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Extensive research continues to find catalytic methods and straightforward syntheses for biological and environmental applications. In particular, the architecture of new fluorescent tools is of huge demand. Push-pull dyes exhibiting the two-photon absorption (2PA) property are of particular interest. These dyes are highly responsive to changes of environment. They constitute useful biosensors and probes for specific detections of nucleic acids. They also enable imaging and penetration into cells with reduced photodamage.

Our work presents:

1. Step-economic and concise approaches to a spectrum of push-pull fluorene dyes: As an example, a planned route involved one-pot synthesis installing both the electron-donor and acceptor. Another route comprised selective formylation followed by C-N cross coupling via air-stable palladium catalytic systems.
2. Photophysical characterization and structure-property relationships of a library of 20 synthesized fluorene compounds.
3. Application of an optimized solvatochromic fluorene probe to imaging lipid organization in cell membranes. The presented fluorene dye outperforms the features of popular probes like Laurdan. Some of the established improvements are: red-shifted absorption that matches the 405 nm diode laser, higher brightness decreasing the used concentration for such staining by 20 folds, remarkable photostability, compatibility with two-photon excitation at wavelength more than 800 nm, among others.

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Biography

Janah Shaya is a postdoctoral fellow and instructor with the CNRS at the IPCMS of Strasbourg (Institut de Physique et Chimie des Matériaux de Strasbourg) in collaboration with Kyushu University, Japan. He joined the IPCMS in October 2016. He got his PhD degree from University of Nice, Sophia Antipolis in France in September 2016 with honor distinction and medal. His work was peer-reviewed and selected for filming for the ACS website at the American chemical society in Philadelphia His principal axes of research are material sciences, biosensors, organic synthesis, photophysics electrochemistry, and applications (energy storage systems and CO_2 valorization). He is currently the co-editor of two books on carbon dioxide and cross couplings with intechopen publisher.

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