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Session II: Sensors

Applications of organic dyes in life science industries

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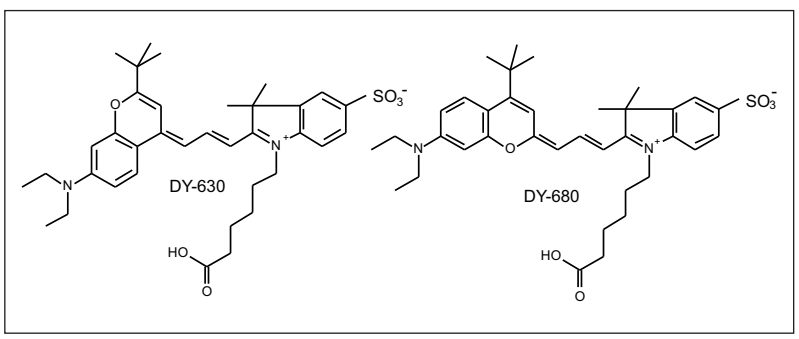
Dr. Czerney is Managing Director of Dyomics GmbH (Dyes & Genomics/Proteomics) established in 1999. Peter has more than 40 years of experience in academic research and life sciences industries (ORWO/AGFA-FilmfactoryWolfen, Carl Zeiss Jena). He continued as Assistant lecturer at TU Dresden, Germany after earning his PhD. in the field of laser dyes in 1978. From 1983 to 1999 he was at Friedrich Schiller Universität Jena, Germany as a faculty member at the institute of Physical Chemistry. He worked with Prof. O. S. Wolfbeiss at Karl-Franzens University Graz, Austria in the area of NIR-sensor dyes in 1989. He completed his habilitation, a post-Ph.D. second research thesis, in 1995 and then spent two years in the Center for Heterocyclic Compounds headed by Prof. A. R. Katritzky at University of Gainesville, USA. In 1999, his entrepreneurial nature finally broke free and he founded Dyomics.

Dr. Czerney's research interests include dye chemistry, new high quality “tailor made” dyes for bio-analysis and related fields of technology, markers for bio-molecular research, sensor dyes and diode laser compatible fluorescent labels for innovative platforms. He is author and named inventor of over 60 scientific publications and about 50 patent applications.

Abstract

This presentation offers an insight into the design, synthesis and tailoring of completely new organic dyes that function as fluorophores possessing useful properties for application in various life sciences industries. These dyes are based on the well-known polymethine concept developed in the mid-1960s by which it became possible to generate valuable hybrid chromophores. These include both, di-benzopyrylium (xanthylium/rhodamines) as well as indocyanine building blocks connected by an odd number of sp2 carbon atoms. The former are completely rigid, whereas the terminal N atom in indocyanines is a part of the indole heterocycle. We came up with the idea of combining the valuable properties of rhodamines (dibenzopyrylium) and indocyanines by developing hybrid chromophores. We developed suitable 7-aminosubstituted 1-benzopyrylium compounds with CH acidic reactive centres in the 2- or 4-position as terminal building blocks. By using C-1-, C-3- or C-5-synthons it was possible to easily synthesize unsymmetrical tri-, penta- and heptamethines.

To tailor the new hybrid-chromophores for different applications in life sciences industries it was necessary to improve water solubility, reduce nonspecific mutual reaction, increase thermic and photochemical stability and provide opportunities to react selectively with the desired biomolecules.



Currently the developed labels are used in many fields in biological research and medical diagnostics including DNA-sequencing, genomic analysis, high resolution microscopy, flow cytometry and in vivo imaging.