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Influence of chlorine atoms in bay positions of perylene-tetracarboxylic acids on their spectral properties in Langmuir-Blodgett films

Emilia Piosik, Anna Synak, Tomasz Martyński

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Influence of chlorine atoms in bay positions of perylene-tetracarboxylic acids on their spectral properties in Langmuir-Blodgett films

Emilia Piosik[a,*], Anna Synak[b], Tomasz Martyński[a]

[a] *Faculty of Technical Physics, Poznan University of Technology, Piotrowo 3, 60-965 Poznań, Poland*
[b] *Department of Mathematics, Physiscs and Informatics, University of Gdańsk, Wita Stwosza 57, 80-952 Gdańsk, Poland*

Abstract

The influence of chlorine atoms in the bay positions of the perylene-3,4,9,10-tetracarboxylic acids with the different alkyl chains length on their spectral properties in monomolecular films has been studied. The chlorinated (PCln) and for comparison non-chlorinated (Pn) perylene derivatives were deposited onto quartz plates using a Langmuir-Blodgett (LB) technique. The absorption spectra showed that the PCln and Pn dyes form in monolayers the I- and J-type aggregates, respectively. In turn, their steady-state and time-resolved emission spectra revealed presence of two emitter types, which we assigned to monomers and excimers. The luminescence lifetimes of the PCln monomers and excimers determined with a time-correlated single photon counting method (TCSPC) are significantly shorter than these obtained for the same emitter types in the Pn monolayers. In the case of the chlorinated dyes, the contribution of the monomer emission dominates over the excimer emission and is almost independent from the alkyl chain length. By contrast, the share of the Pn monomer emission increases strongly with a number of carbon atoms in their hydrocarbon chains. The luminescence quantum yields (LQY) of the Pn and PCln monolayers measured in an integrating sphere are in the range of 0.06-0.11. The presented

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[*] Corresponding author.

Email addresses: `emilia.z.piosik@doctorate.put.poznan.pl` (Emilia Piosik), `a.synak@ug.edu.pl` (Anna Synak), `tomasz.martynski@put.poznan.pl` (Tomasz Martyński)

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