22nd International Conference on
Diffusion in Solids and Liquids
22 TO 26 JUNE 2026 | RHODES, GREECE

ABSTRACT:

Structurally Tunable Organic Dyes for Advanced Photonic Applications

B. Potaniec[1], M. Zdończyk[2], A. Bachmatiuk[1,2]

[1]Faculty of Chemistry, Wrocław University of Science and Technology, Wybrzeże Wyspiańskiego 27, 50-370 Wroclaw, Poland

[2]Electron Beam Emergent Additive Manufacturing (EBEAM) Centre, Centre for Nanotechnlogy (CNT), Centre for Energy and Environmental Technologies (CEET), VŠB-Technical University of Ostrava, 17. Listopadu 15, 70800 Ostrava, Czech Republic

The rapid development of photonic technologies is driving the demand for advanced organic materials that combine tunable optical properties with high thermal and chemical stability. In this context, designing functional chromophores with well-defined structure–property relationships is particularly important [1].

Functional chromophores based on diketopyrrolopyrroles (DPPs), chalcones, and their derivatives enable precise tuning of absorption and emission characteristics through structural modification with electron-donating and electron-withdrawing substituents [2]. Moreover, these dyes exhibit high thermal stability, good solubility, and strong luminescence. Incorporation into sol–gel glass matrices yields stable hybrid materials suitable for photonic applications [3].

Additionally, electron beam structuring enables precise micro- and nanoscale patterning of dye-doped systems. The combination of high stability, tunable optical properties, and good processability makes these materials promising candidates for light-emitting devices, optical sensors, and integrated photonic systems.

[1] J. M. Hales, S. Barlow, H. Kim, S. Mukhopadhyay, J.-L. Brédas, J. W. Perry and S. R. Marder, Chem. Matter., 26, 549 (2014).

[2] B. W. H. Saes, M. Lutz, M. M. Wienk, S. C. J. Meskers and R. A. J. Janssen, J. Phys. Chem. C., 124, 25229 (2020).

[3] M. Zdończyk, B. Potaniec, M. Skoreński, J. Cybińska, Materials, 15, 203 (2022).