The Hybrid of Indolizine and Rhodol – New Class of Dyes

B. Koszarna,[a] J.S.A. Badaro,[a] M. Perkowska,[a] K. Kandere-Grzybowska,[b,c] D. V. Korygina,[b] B. Grzybowski,[a,b,c] I. Deperasińska,[d] D. T Gryko[a]

[a]Institute of Organic Chemistry, Polish Academy of Sciences, Kasprzaka 44/52, 01-224 Warsaw, Poland
[b]Center for Algorithmic and Robotized Synthesis, IBS, Ulsan 44919, Republic of Korea
[c]Department of Biomedical Engineering, UNIST, Ulsan 44919, Republic of Korea
[d]Institute of Physics, PAS, Al. Lotników 32/46, 02-668 Warsaw, Poland
beata.koszarna@icho.edu.pl

Unlocking the potential of electron-rich 2-hydroxyindolizines led to the discovery of a new class of dyes – indolizine-merocyanines (IndMer) and indolizine-cyanines. Tandem Friedel-Crafts alkylation followed by intramolecular nucleophilic aromatic substitution affords structurally diverse dyes.[1]

A direct condensation of 2,3,5,6-tetrafluoro-4-hydroxybenzaldehyde with 2-hydroxyindolizines proceeds via a tandem process involving Friedel-Crafts alkylation and nucleophilic aromatic substitution. Highly electron-rich 2-hydroxyindolizines serve as analogues to 3-dialkylaminophenols, enabling the formation of previously unknown hybrid dyes – indolizinemerocyanines (IndMer). This strategy can be extended to π-expanded 2-hydroxyindolizines and 2-hydroxyimidazo[1,2-*a*]pyridines.

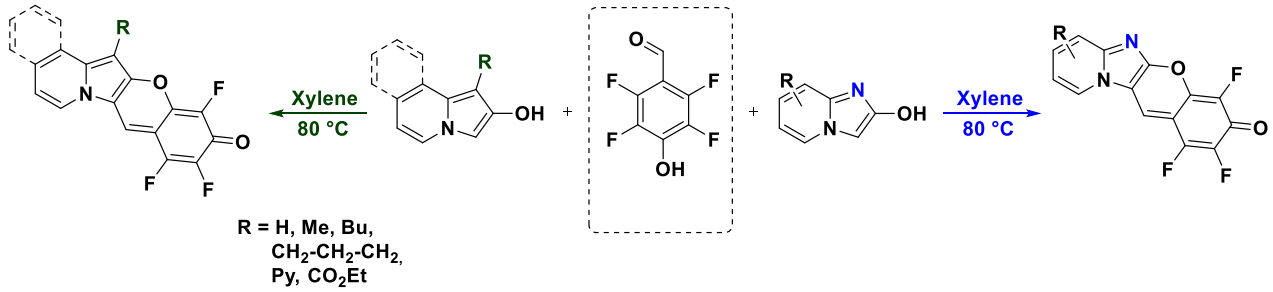

Figure 1. Straightforward synthesis of the new class of dyes**.**

The new dyes exhibit excellent photophysical properties, including high molar absorption and fluorescence quantum yields exceeding 50%. Additionally, positively charged indolizine–cyanine derivatives show strong potential for bioimaging, selectively targeting mitochondria or RNA-rich nucleoli in living cells. This work introduces a versatile and scalable approach, opening new directions in the design of functional merocyanine dyes.

1 B. Bardi, K.V. Vygranenko, B. Koszarna, O. Vakuliuk, D.T. Gryko, F. Terenziani, A. Painelli, *Chem. Eur. J.*, **2023**, *29*, e202300979.