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FAST AND ULTRAFast PHOTOINDUCED CHARGE TRANSFER PROCESSES IN DYE SENSITIZED TiO₂ ELECTRODES

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Donor-acceptor organic dyes are of interest in different solar applications, such as light absorbers in dye sensitized solar cells, or photosensitizers for photoinduced water splitting.^{1,2} Herein we present a series of dyes incorporating different heterocyclic units as sensitizers for TiO₂ photoelectrodes prepared by screen-printing, investigated by means of steady-state optical techniques and femtosecond transient absorption spectroscopy. Sensitised electrodes were analysed and compared with the same dyes in solution, to unravel excited state deactivation pathways and charge carrier dynamics.

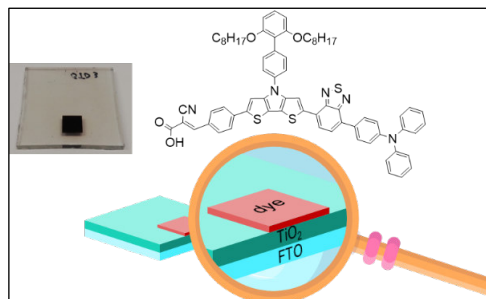


Figure 1: Scheme of the photoanodes architecture (a dye structure is shown as an example).

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1. A. Dessì, D. A. Chalkias, S. Bilancia, A. Sinicropi, M. Calamante, A. Mordini, A. Karavioti, E. Stathatos, L. Zani, G. Reginato, *Sustain. Energy Fuels*, **5**, 1171 (2021).
2. X. Yzeiri, N. Sangiorgi, F. Gambassi, A. Barbieri, M. Calamante, D. Franchi, C. Coppola, A. Sinicropi, B. Ventura, A. Mordini, A. Sanson, L. Zani, *Dyes Pigm.*, **232**, 112455 (2025).