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Topology-related optoelectronic processes in triphenylamine-based 2D covalent organic frameworks

Université de Strasbourg
Excellence University

Luca Cusin, Dr. Francesca Urban, Pietro Antonio Livio, Dr. Artur Ciesielski, Prof. Paolo Samorì*

Institut de Science et d'Ingénierie Supramoléculaires, Université de Strasbourg and CNRS, Strasbourg, France

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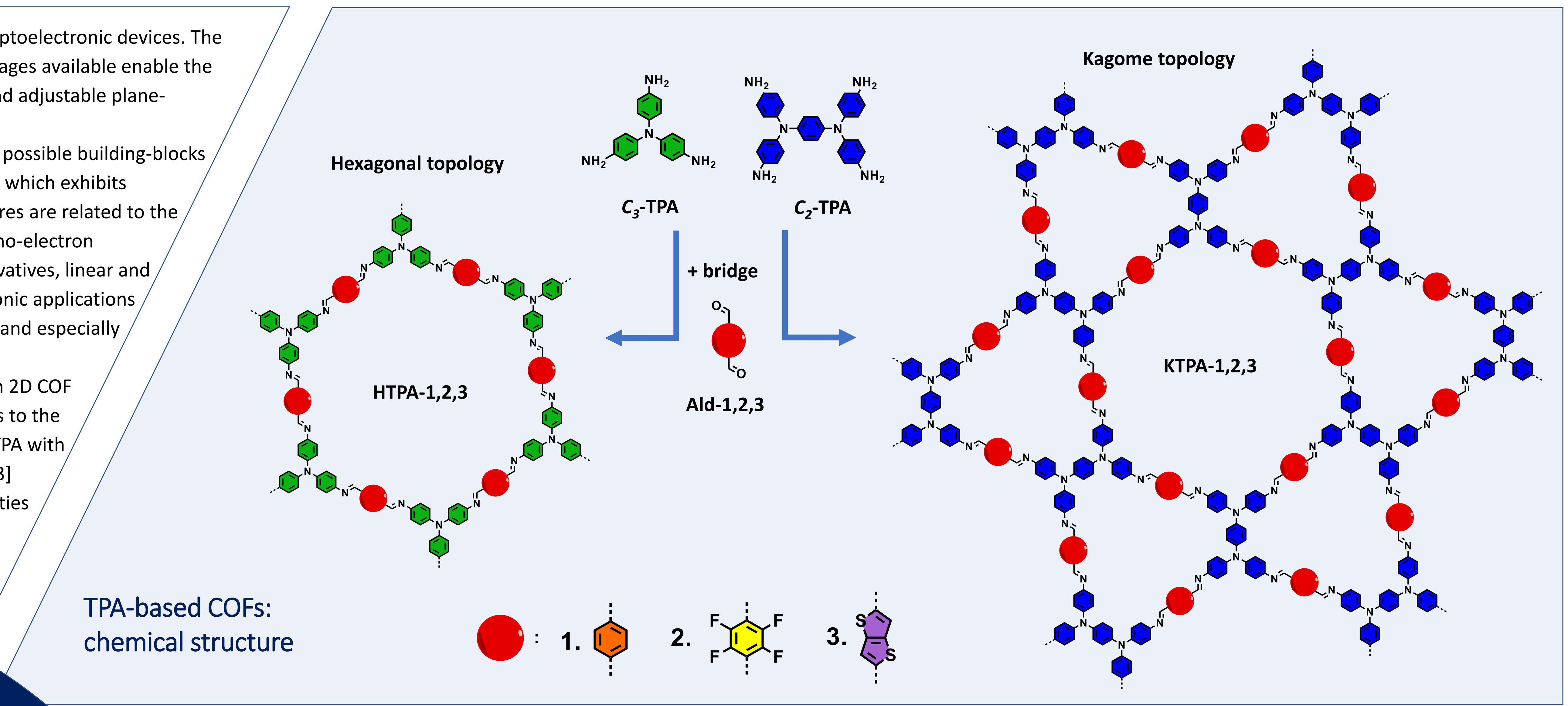
2D COFs are appealing candidates for advanced applications in optoelectronic devices. The combination between the vast choice of building-blocks and linkages available enable the fabrication of polymeric materials with specific functionalities and adjustable plane-extended π-conjugation.[1]

Recently, triphenylamine (TPA)-based moieties have emerged as possible building-blocks in 2D COFs. TPA is a thermally stable, propeller-shaped molecule which exhibits interesting photoactive and electroactive behaviors. These features are related to the stability of corresponding radical cation, easily generated by mono-electron oxidation. TPA-based advanced materials such as molecular derivatives, linear and branched polymers have been developed for various optoelectronic applications such as photoconductive, light-emitting, electrochromic devices and especially as hole transporting materials.[2]

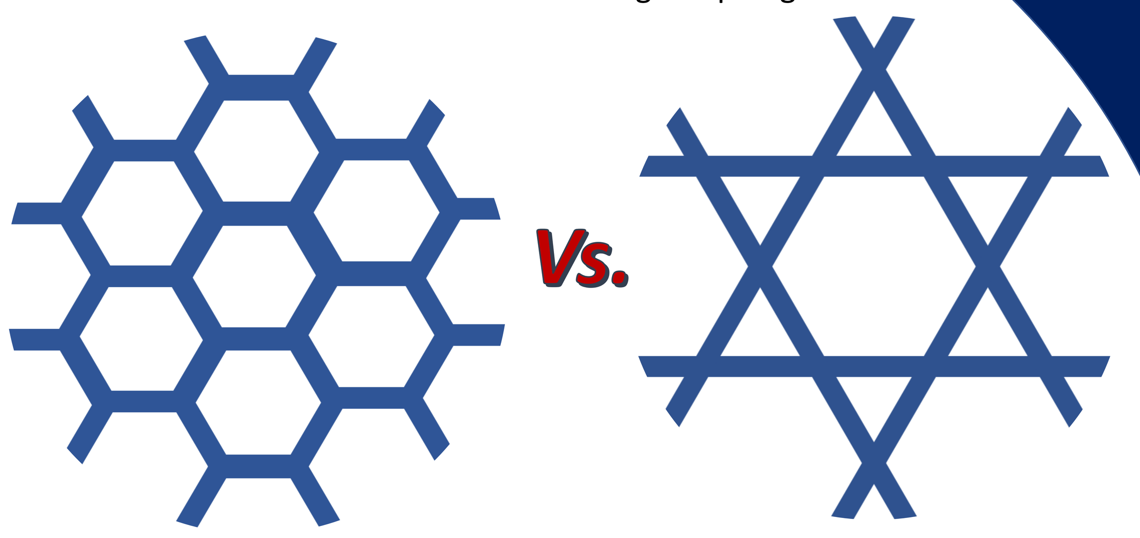
Herein, we report the integration of two types of TPA moieties in 2D COF thin films. Polymerization of C_3-TPA with linear dialdehydes leads to the formation of a hexagonal topology while the reaction of the C_2-TPA with the same bridges leads to the formation of a Kagome topology.[3]

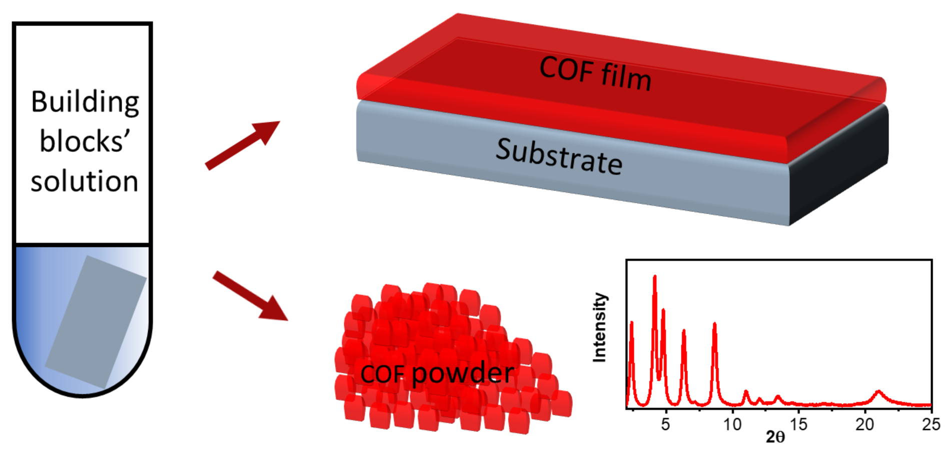
Our results show photoconductive and hole-transporting properties of the resulting materials and suggest that the topology of the framework might have an impact on the final behavior.[4]



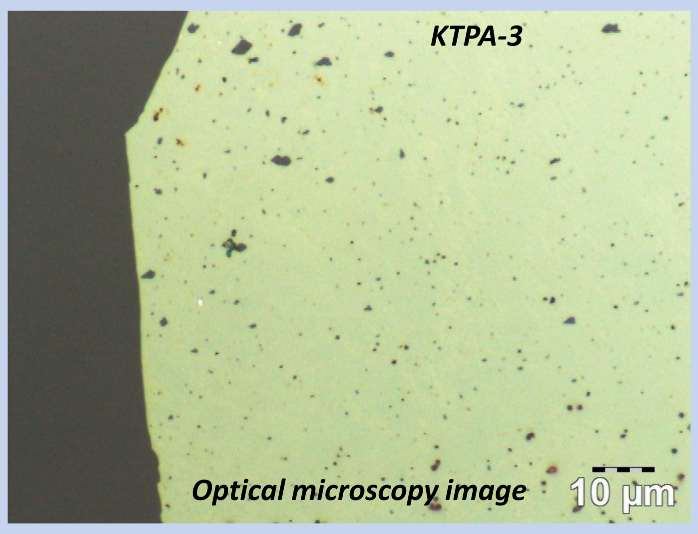
Aim

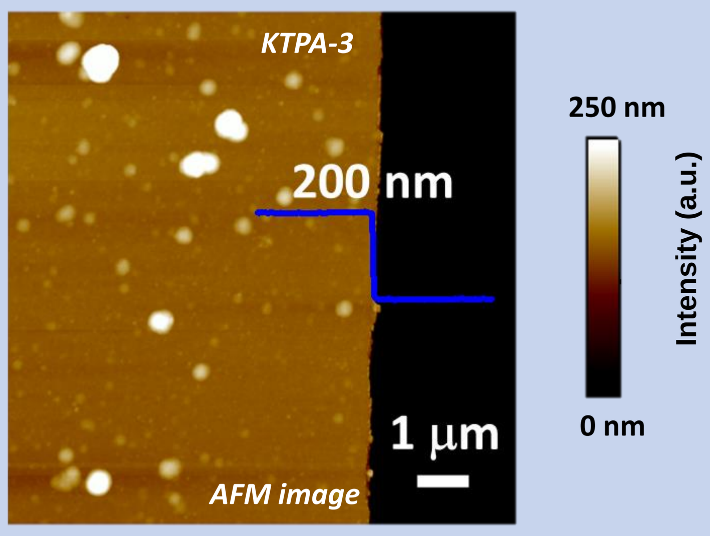
Study and compare the (opto)electronic properties of TPA-based COFs with hxl and kgm topologies

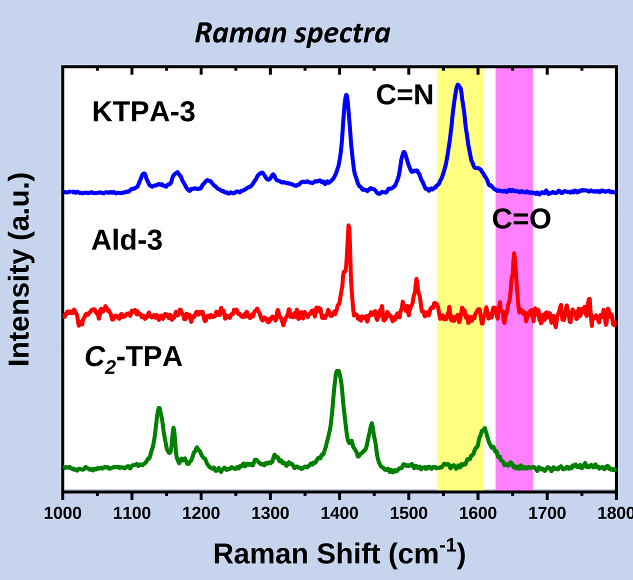


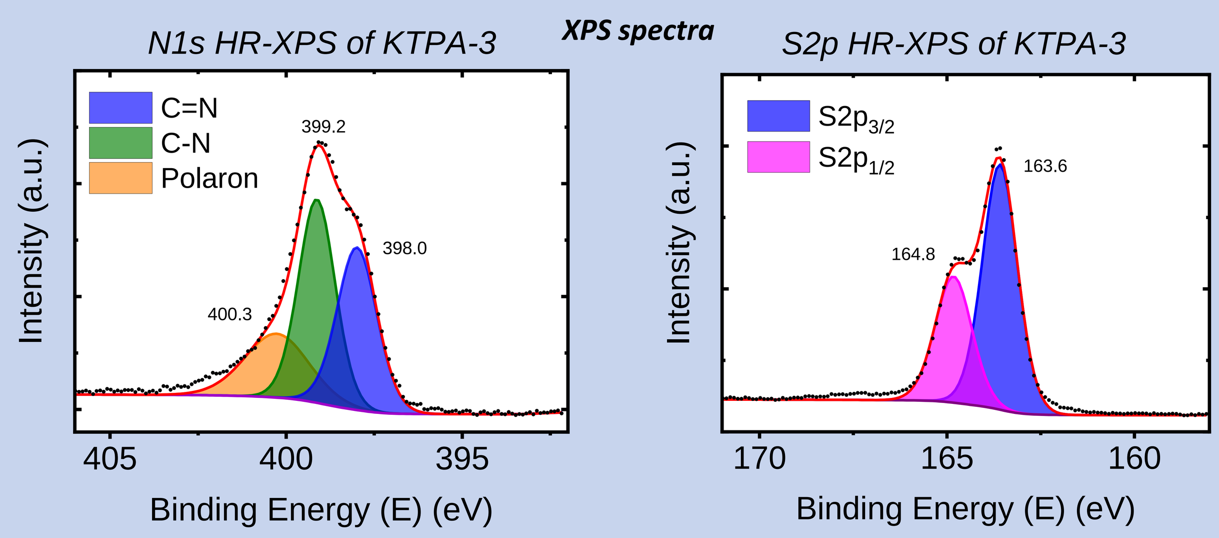


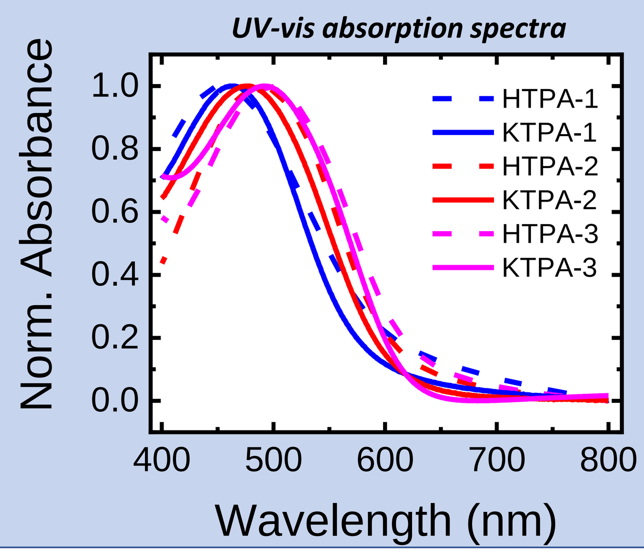
Thin films: morphological and chemical characterization



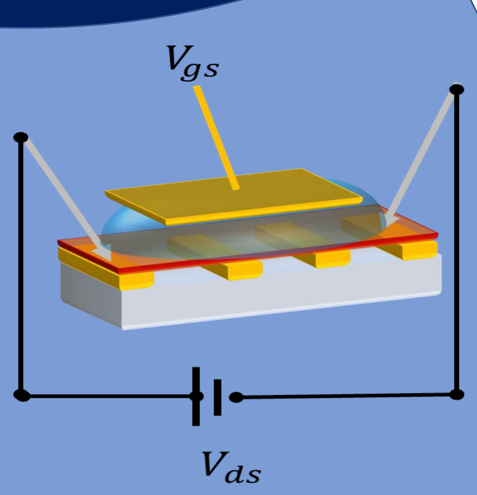


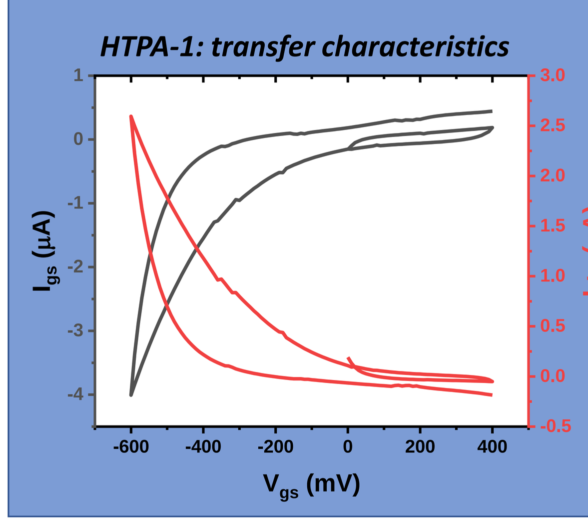


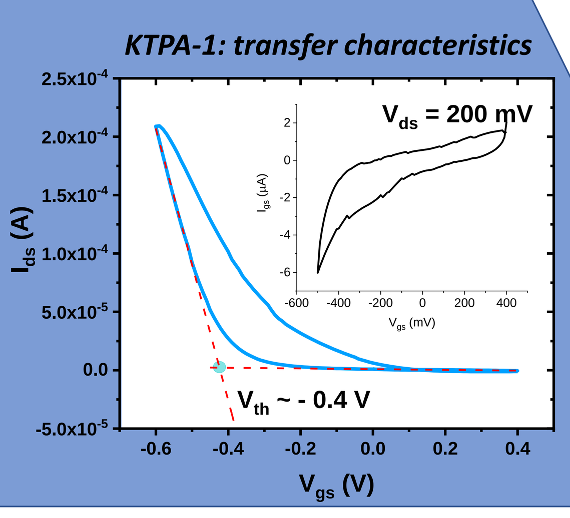




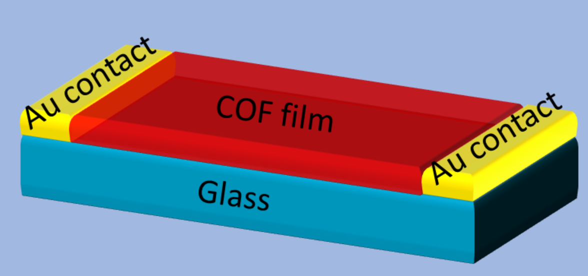
Electrical characterization: 3-terminal device

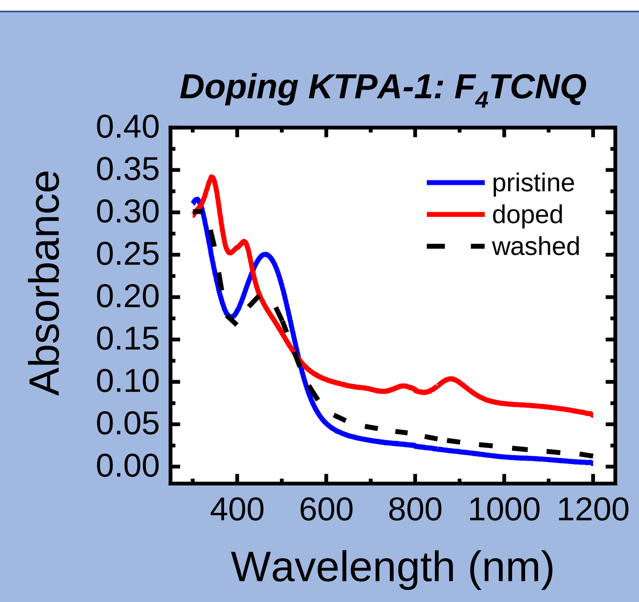






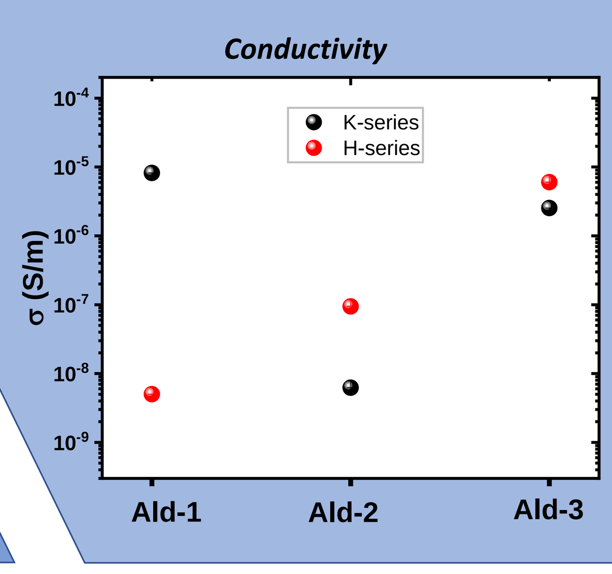
Electrical characterization: 2-terminal device

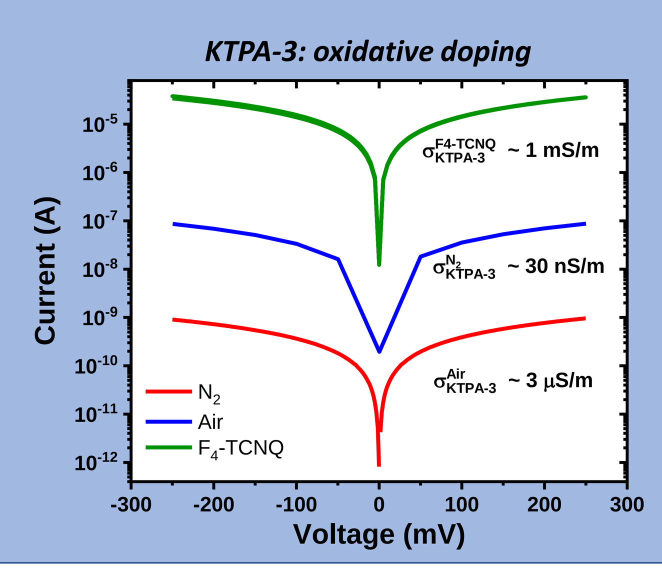


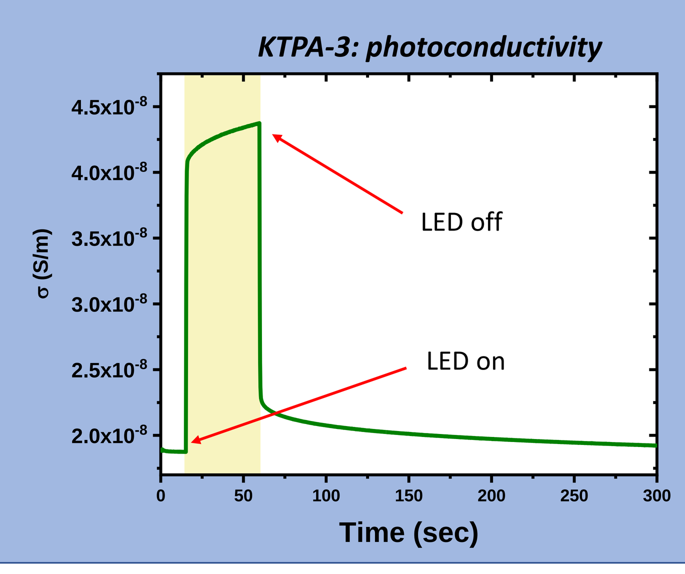


Optical bandgaps

Thin film	$\lambda_{max,abs}$ (nm)	$E_{g,opt}$ (eV)
HTPA-1	454	2.13
KTPA-1	463	2.24
HTPA-2	487	2.13
KTPA-2	476	2.18
HTPA-3	497	2.06
KTPA-3	493	2.11







CONTACT PERSON

lcusin@unistra.fr

REFERENCES

[1] N. Keller, T. Bein, *Chemical Society Reviews*, 50 (**2021**) 1815-1845
[2] H. Yen, G. Liou, *Progress in Polymer Science*, 89 (**2019**) 250-287
[3] J. Rotter, R. Guntermann, *et. al.*, *Chemical Science*, 11 (**2020**) 12843-12853
[4] E. Jin, K. Geng, *et. al.*, *Angewandte Chimie International Edition*, 59 (**2020**) 12162-12169

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