

ELECTRONIC PROPERTIES OF NEW POLYCYCLIC AROMATIC MONO AND DICARBOXIMIDES

Alexandra Harbuzaru^a, Matias J. Alonso-Navarro^{b,c}, J. Teodomiro López Navarrete^a, Rocío Ponce Ortiz^a, José L. Segura^b

^aDepartament of Physical Chemistry, Málaga University, Málaga, Spain,

^bDepartment of Organic Chemistry, Complutense University of Madrid, Madrid, Spain,

^cChemical and Environmental Technology Department. Rey Juan Carlos University, Madrid, Spain

e-mail: harbuzaru@uma.es

Keywords: PADI, metal-free reactions, multiple redox, OFETs

A series of nitrogen-doped polycyclic aromatic mono and dicarboximides (PADI) has been synthesized^[1]. Their interest lies in the fact that, unlike other PADI systems, this new family of compounds was synthesized by an innovative procedure that avoids metal-based cross-coupling reactions (Figure 1). In addition, these molecules are able to stabilize multiple redox processes, making them attractive for future electronic devices and batteries^[2,3].

Among the synthesized materials, the semiconductors based solely on naphthalimide units were designed to exhibit electron transporting properties, while the synthesis of the systems based on pyrene and naphthalimide moieties was approached to obtain ambipolar behavior. In our study, we investigated the interplay of different effects such as (i) the type of solubilizing chains (naft-2-4), (ii) the all-acceptor vs donor-acceptor nature of the systems (naft-1 vs naft-2) and (ii) the molecular ordering on the organic field effect transistor (OFET) device response characteristics.

Interestingly, we found that all-acceptor systems (naft-2-4) show multiple reduction processes, in which up to tetranion species were stabilized, while the donor-acceptor derivative (naft-1) shows amphoteric redox behavior, in which only up to dianion species were obtained. This lately is in good agreement with the ambipolar mobilities observed for naft-1 in OFETs, while only electron mobilities were registered for naft-2-4 systems.

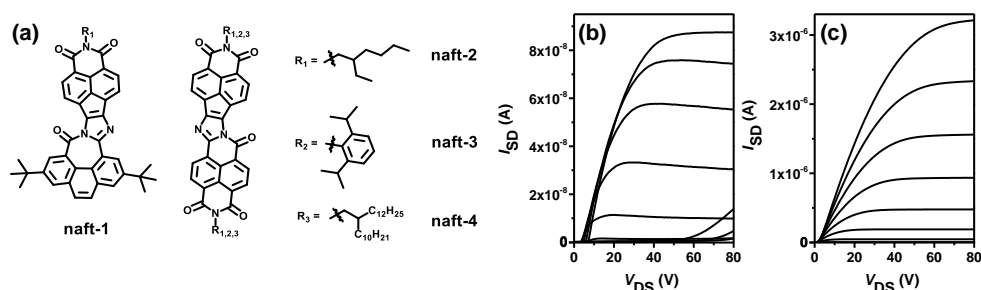


Figure 1. (a) Chemical structures of imide-functionalized naft-1-4 systems, (b) and (c) OFET output curves for naft-1 and naft-4, respectively (V_{GS} ranges from 0 to 80 V in steps of 10 V).

References

- [1] M. J. Alonso-Navarro, A. Harbuzaru, M. Martínez-Fernández, P. Pérez Camero, J. T. López Navarrete, M. M. Ramos, M. M. R. Ponce Ortiz, J. L. Segura, *J. Mater. Chem. C* **2021**, 9, 7936–7949.
- [2] T. Murata, T. Koide, H. Nobukuni, R. Tsuji, Y. Morita, *Int. J. Mol. Sci.* **2020**, 21.
- [3] T. B. Schon, B. T. McAllister, P.-F. Li, D. S. Seferos, *Chem. Soc. Rev.* **2016**, 45, 6345–6404