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# Investigation of electronic and morphological changes from thionation of naphthalene diimide (NDI)

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Organic semiconductors (OSCs) possess many inherent advantages that allow them to be used effectively as organic field effect transistors (OFETs). Solution processablility allows rapid, large area fabrication on low cost flexible substrate that make them ideal for specialized applications such as flexible displays and radio frequency identification (RFID).

Small molecule OSCs provide chemical specificity that allows changes to be mapped and examined more effectively than polymer based OSCs. Naphthalene diimide (NDI) provides a versatile framework with which to build upon and explore the effects of chemical functionalization. Recent work [1] on a small molecule framework from the same chemical family has shown that substitution of oxygen for sulphur, known as thionation, leads to an increase in crystallinity and an electron mobility. A thionated series of NDI OSCs has been synthesized to examine the effects of increased degrees of thionation on optical, electronic and morphological properties. Investigation via the complimentary synchrotron based techniques of near edge x-ray absorption fine structure (NEXAFS) spectroscopy and grazing incidence wide angle xray scattering (GIWAXS) combine with atomic force microscopy (AFM) and top gate bottom contact (TGBC) transistors to help illuminate the resulting changes of the top interface with increasing degrees of thionation.

[1] Tilley, A. J., Guo, C., Miltenburg, M. B., Schon, T. B., Yan, H., Li, Y. and Seferos, D. S. (2015), Thionation Enhances the Electron Mobility of Perylene Diimide for High Performance n-Channel Organic Field Effect Transistors. Adv. Funct. Mater., 25: 3321–3329. doi:10.1002/adfm.201500837

## Keywords or phrases (comma separated)

GIWAXS, NEXAFS, OFET

## Are you a student?

Yes

## Do you wish to take part in</br>the Student Poster Slam?

Yes

## Are you an ECR? (<5 yrs</br>since PhD/Masters)

No

## What is your gender?

Male

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