SUPPORTING INFORMATION

Synthesis and Characterization of Naphthalenediimide Thienothiophene Conjugated Polymers for OFET and OPT Applications

Dilara Gunturkun [a], Recep Isci [a], Sheida Faraji [a, b], Berkay Sütay [a], Leszek A. Majewski[b], Turan Ozturk [a, c], *

[a] Istanbul Technical University, Department of Chemistry, 34469 Istanbul, Turkey.

[b] Department of Electrical and Electronic Engineering, University of Manchester, Sackville Street, Manchester M13 9PL, UK.

[c] TUBITAK UME, Chemistry Group Laboratories, Gebze, Kocaeli 54, 41470, Turkey.

Contents

1. Optic Properties

Fig. S1 UV-Vis absorption spectrum of the polymers on ITO.

## 2. Thermal Properties
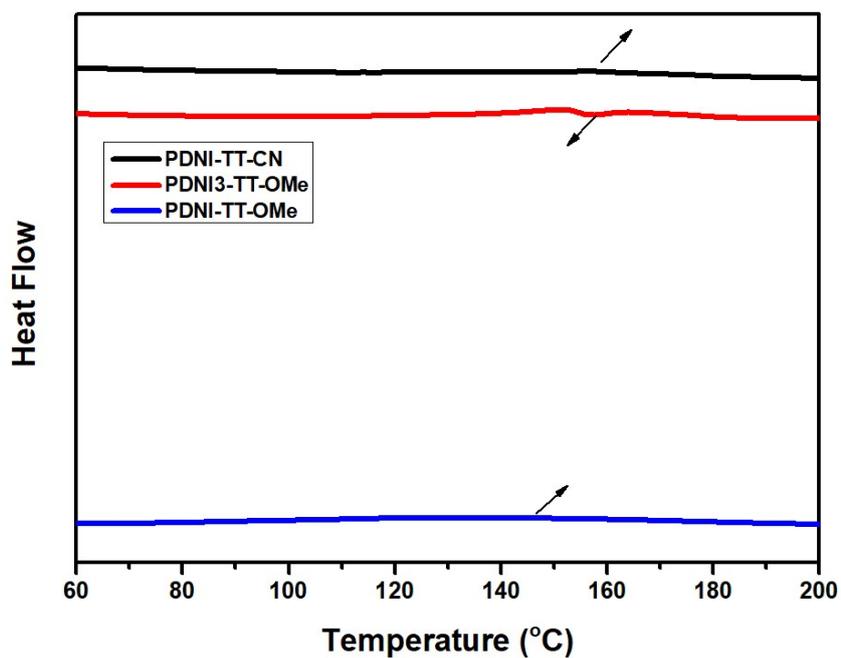
Fig. S2 DSC curves of the polymers.

3. Computational Chemistry
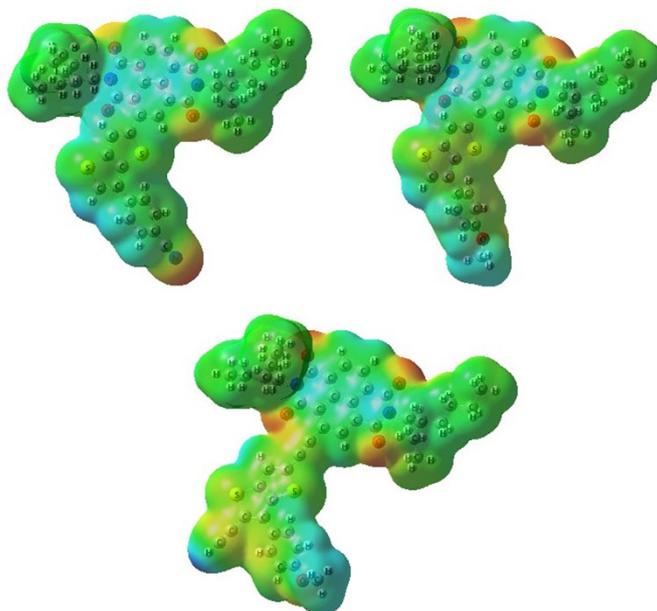
Fig. S3 Molecular electrostatic potential maps of **PNDI-TT-CN** (top-left), **PNDI-TT-OMe** (top-right) and **PNDI3-TT-OMe** (bottom) molecules.
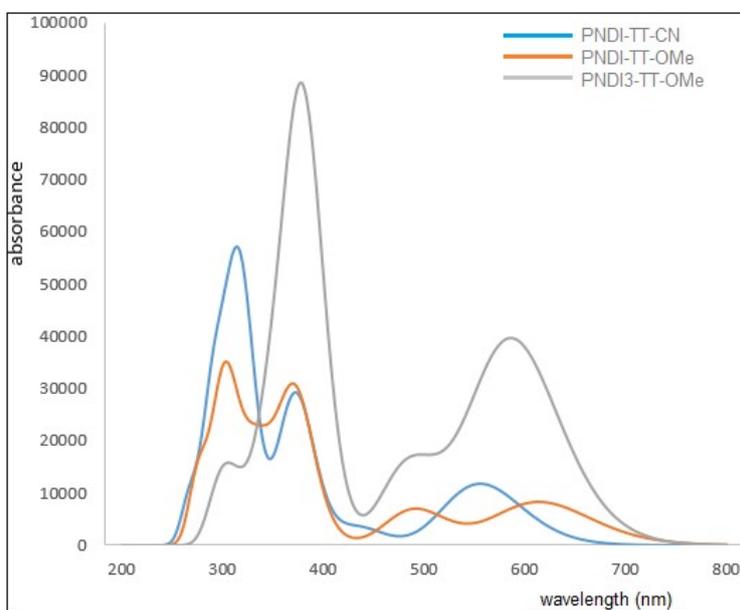

Fig. S4 Theoretical UV-VIS spectra of the studied molecules (*in THF*).

4. Organic Phototransistor Devices
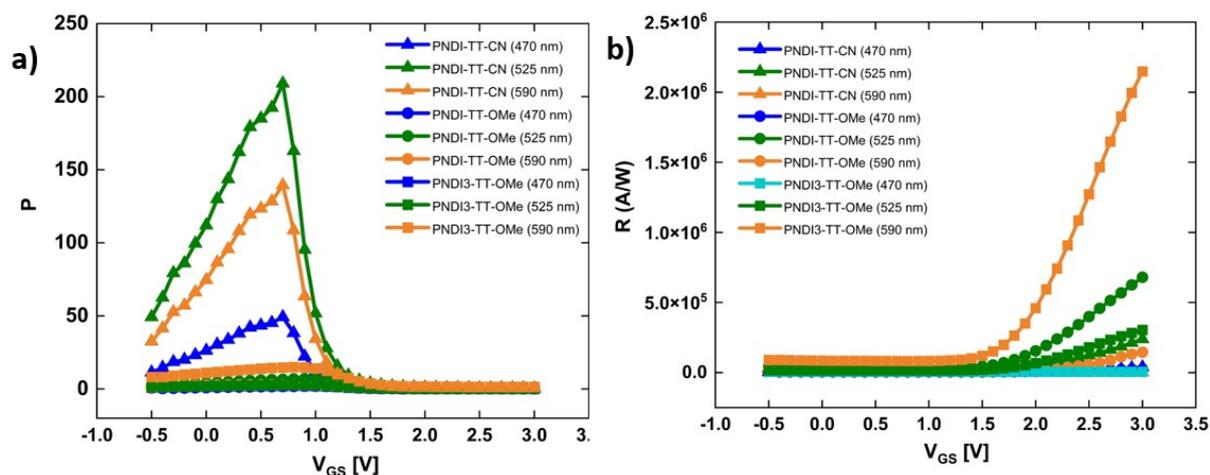
Fig. S5 Comparative plots of (a) photosensitivity and (b) photoresponsivity of the polymers OPTs under illumination to different light wavelengths.

5. Gel Permeation Chromatography Analysis

Result of molecular weight calculation (RI)
Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	7.107	-26.907	75,039	Mn	9,205
Peak top	8.435	-11.932	5,219	Mw	18,088
Peak end	8.605	-13.608	3,676	Mz	33,454
				Mz+1	44,105
				Mv	18,088
Height [mV]			3.185	Mp	5,220
Area [mV*sec]			110.272	Mz/Mw	1.850
Height% [%]			55.608	Mw/Mn	1.965
[eta]			18087.81145	Mz+1/Mw	2.438

Fig. S6 GPC result of **PNDI-TT-CN.**

Result of molecular weight calculation (RI)
Peak 1 Base Peak

	[min]	[mV]	[mol]		
Peak start	7.293	-0.995	52,044	Mn	8,040
Peak top	7.852	0.329	17,114	Mw	17,182
Peak end	9.073	6.593	1,387	Mz	23,827
				Mz+1	28,407
				Mv	17,182
Height [mV]			1.056	Mp	18,058
Area [mV*sec]			47.230	Mz/Mw	1.387
Height% [%]			9.897	Mw/Mn	2.137
[eta]			17181.59308	Mz+1/Mw	1.653

Fig. S7 GPC result of **PNDI-TT-OMe.**

4

Result of molecular weight calculation (RI)

Peak 1 Base Peak

	[min]	[mV]	[mol]		
				Mn	13,798
Peak start	7.238	-1.085	57,988	Mw	21,175
Peak top	7.828	4.710	17,937	Mz	28,441
Peak end	8.523	16.679	4,351	Mz+1	33,951
				Mv	21,175
Height [mV]			2.361	Mp	17,938
Area [mV*sec]			118.359	Mz/Mw	1.343
Height% [%]			21.222	Mw/Mn	1.535
[eta]			21175.35435	Mz+1/Mw	1.603

Fig. S8 GPC result of **PNDI3-TT-OMe**

6. NMR Spectra
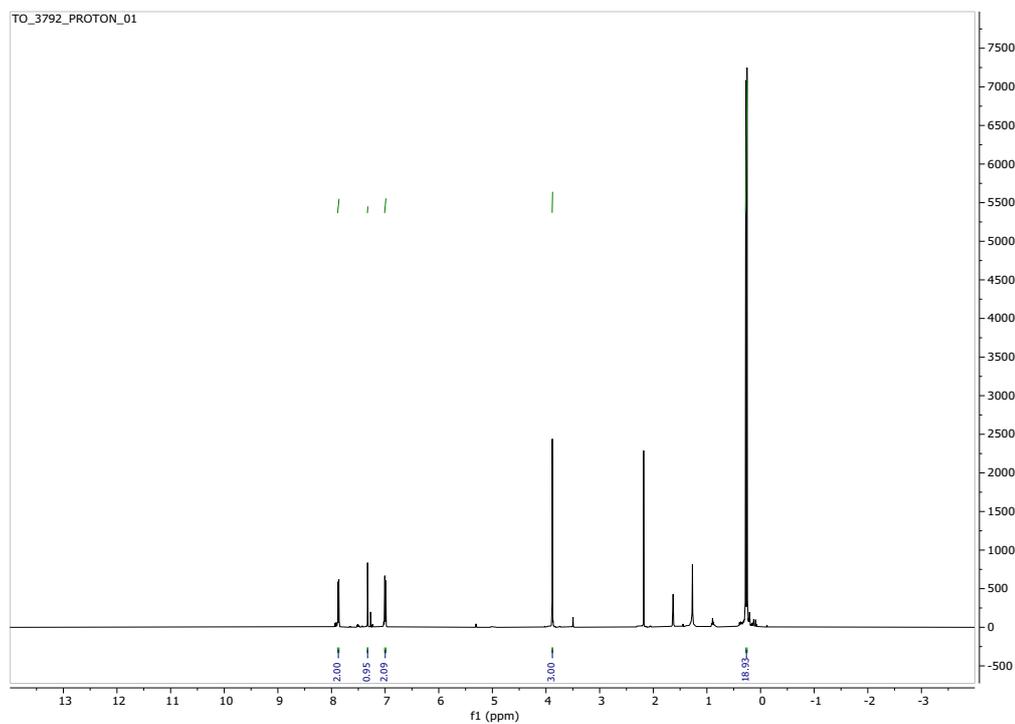
Fig. S9 ^{1}H-NMR spectrum of compound **11.**
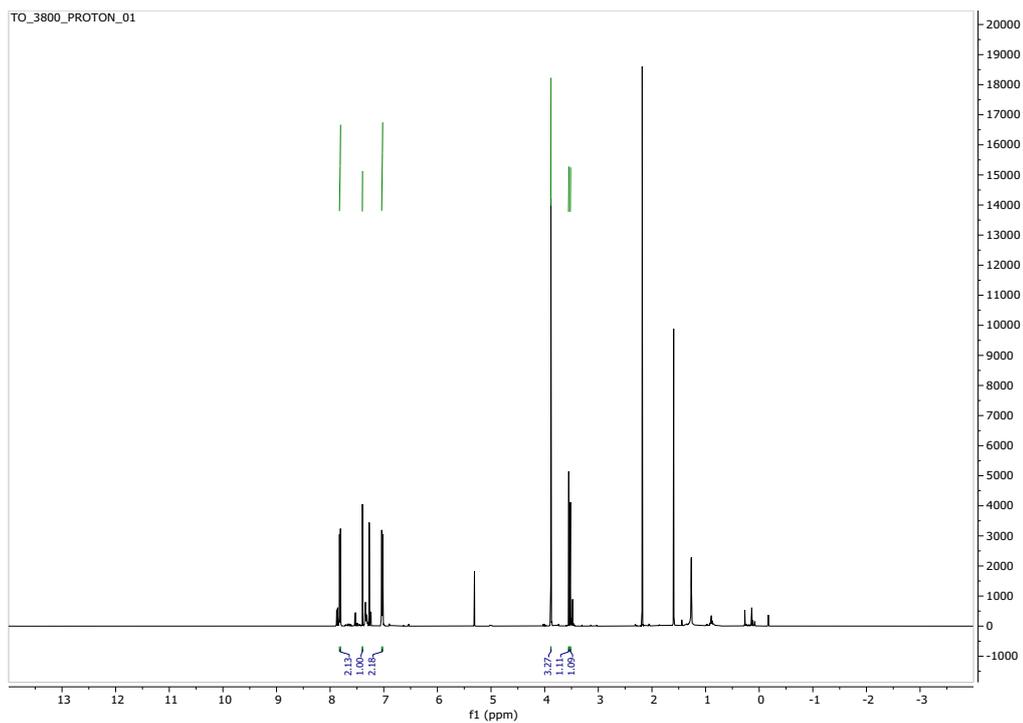
Fig. S10 ^{1}H-NMR spectrum of compound **12.**
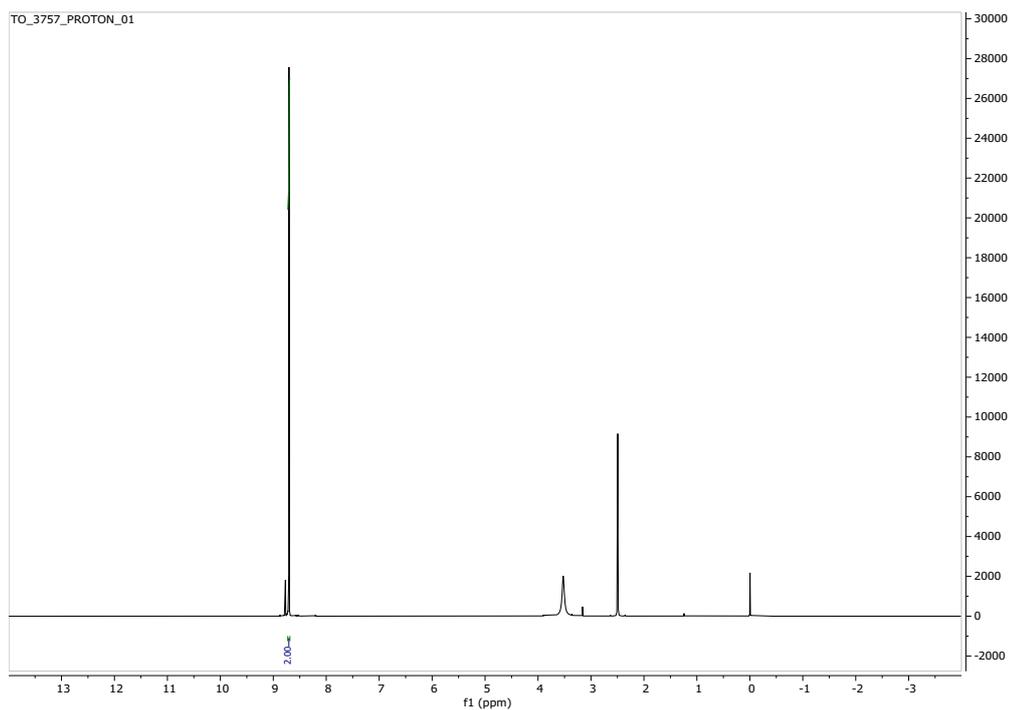
Fig. S11 ^{1}H-NMR spectrum of compound **14.**

8.74

3.95

1.98

16.07

6.00
6.00

2.13

10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)
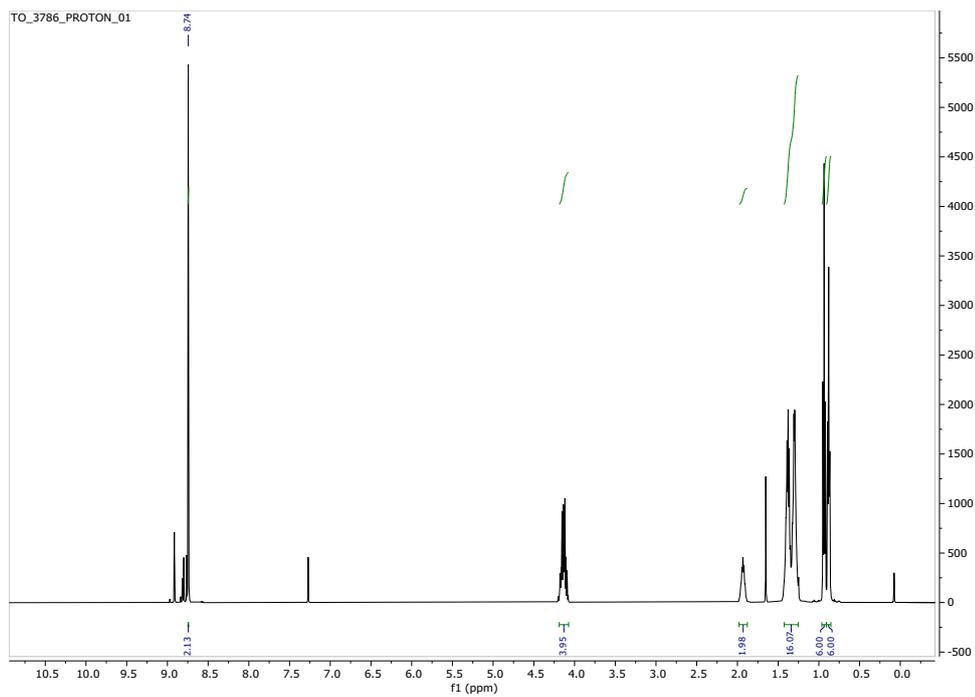
Fig. S12 ^{1}H-NMR spectrum of compound **15.**