# SUPPORTING INFORMATION

## Radical Salt-Doped Hole Transporters In Organic Photovoltaic Devices

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**X-Ray Diffraction on PTPD, PTPD/Salt binary and PTPD/Salt/$C_{60}$ ternary blends:**

X-ray diffraction was used to confirm the morphology of the PTPD films in the presence (10 wt%) and absence of $TMTPD^{\cdot+}$ $SbF_6^-$ radical salt (Figure S1). The PTPD polymer film appears amorphous as evident from the absence of any sharp crystalline peaks in the XRD micrographs. The PTPD/salt binary blend also remains amorphous after the addition of the crystalline small molecule salt.

The XRD micrograph of the film of PTPD/salt/$C_{60}$ ternary blends with 10 wt% and 50 wt% in salt and $C_{60}$ respectively with respect to PTPD is shown in Figure S2. While the PTPD/salt binary blend shows more of an amorphous nature, the PTPD/salt/$C_{60}$ ternary blend shows crystalline features which correspond to $C_{60}$.[1, 2] This suggest that during spin coating the $C_{60}$ readily crystallize out from the amorphous PTPD/salt matrix.

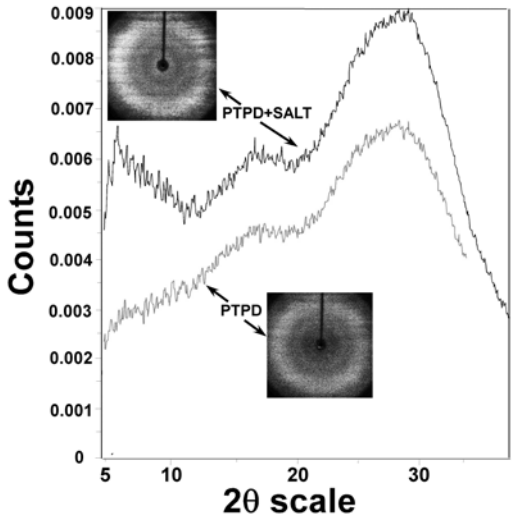


**Figure S1:** X-ray diffraction data of PTPD polymer and the PTPD/salt binary blend.

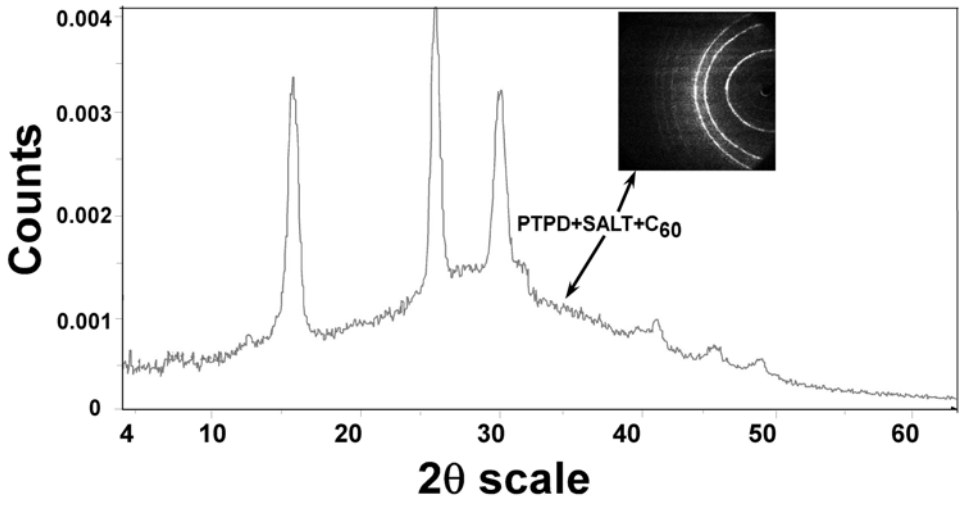


**Figure S2:** X-ray diffraction of PTPD/salt/$C_{60}$ ternary blend. The salt and $C_{60}$ in the ternary blend were 10 wt% and 50 wt%, respectively with respect to the PTPD polymer.

**Dark *J-V* Characteristics of ITO/PTPD-Salt/Al Binary Blend and ITO/PTPD-Salt-$C_{60}$/Al Ternary Blend Devices:**

Figure S3 shows the *J-V* characteristics under no illumination of the ITO/PTPD-salt/Al binary mixture devices for various salt concentrations in PTPD. Even though the devices exhibited no photovoltaic behavior, current densities increased with increasing salt concentration because of increased *p*-type conductivity of the PTPD films. Figure S4 shows the *J-V* characteristics under no illumination of the ITO/PTPD-salt-$C_{60}$/Al ternary mixture devices for various salt concentrations in PTPD. Similar to the ITO/PTPD-salt/Al binary blend devices, the devices exhibited no photovoltaic behavior but the current densities increased with increasing salt concentration.

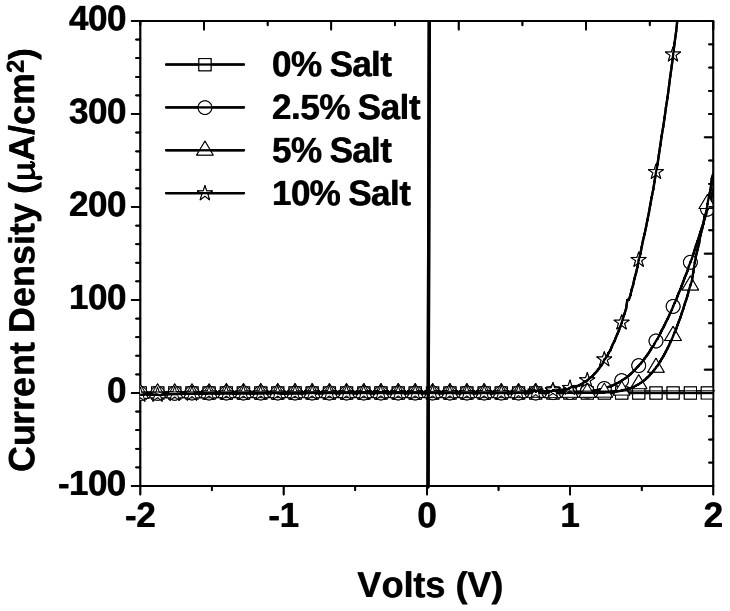


**Figure S3:** *J-V* characteristics under no illumination of the ITO/PTPD-salt/Al binary blend devices with varying salt concentrations.

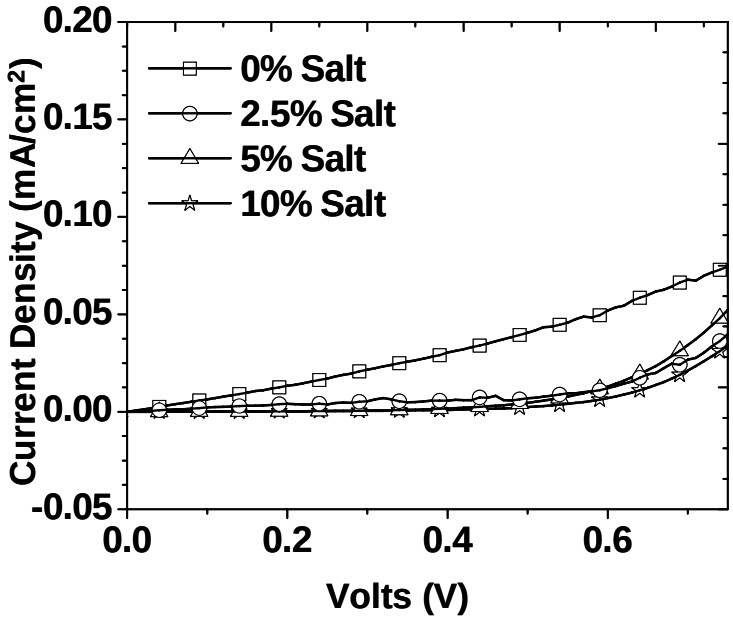


**Figure S4:** *J-V* characteristics under no illumination of the ITO/PTPD-salt-$C_{60}$/Al ternary blend devices with varying salt concentration.

**Comparison of percent increase in absorption and short circuit current density as a function of salt concentration:**

Figure S5 shows the percentage increase in absorption and $I_{sc}$ as function of the salt concentration. As explained in the manuscript, while the increase in salt concentration increases the absorption of the device linearly by c.a. 70% from that of the 0% salt device, the progressive increase in $I_{sc}$ is much higher (c.a. 150%). The latter has been explained by the progressive decrease in series resistance for *p* type conduction through the PTPD/salt phase.

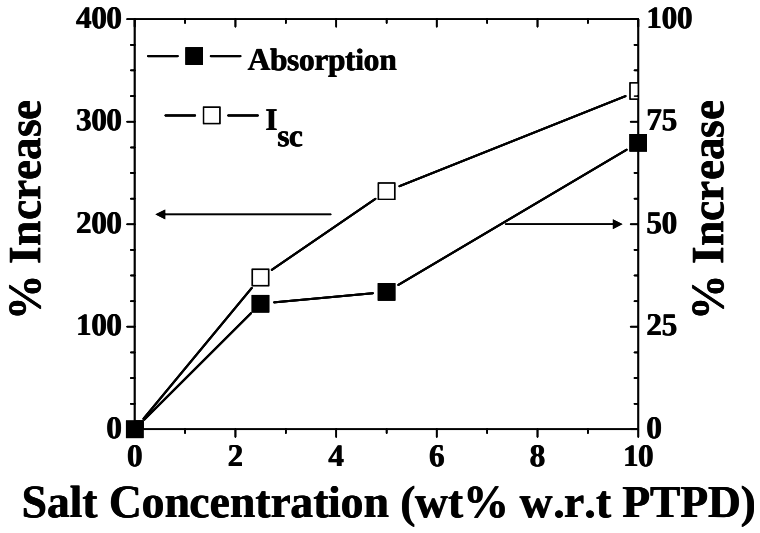


**Figure S5:** Percentage increase in absorption and $I_{sc}$ as function of the salt concentration in PTPD/salt binary blend devices.

**References:**


1. Kutner, W.; Pieta, P.; Nowakowski, R.; J. Sobczak; Kaszkur, Z.; McCarty, A. L.; D'Souza, F.; *Chem. Mater.* **2005,** *17*, 5635.
2. Tomura, K.; Nishizawa, M.; Takemura, D.; Matsue, T.; Uchida, I.; *Chem. Lett.* **1994,** *23*, 1365.