Synthesis of Poly(triarylamine)s and Poly(carbazole)s for the Application in Solution Processed OFETs

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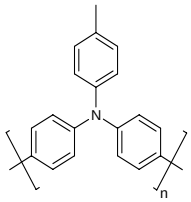
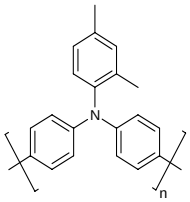
Introduction:

In the past poly(triarylamine)s (PTPAs) have proven their suitability for the application as semiconductor in organic field effect transistors (OFET)[i]. In contrast to most of the other materials used for these applications they are air stable and less moisture sensitive[ii]. They show a rather high charge carrier (hole) mobility and high ON/OFF ratios. Due to their good solubility and their ability to form amorphous films, they are interesting candidates for low cost application techniques from solution such as screen printing, inkjet printing or offset printing.

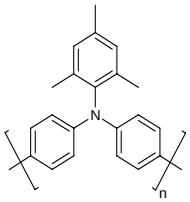
Poly(triphenylamine)s (PTPAs)



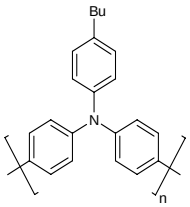
PTPA1



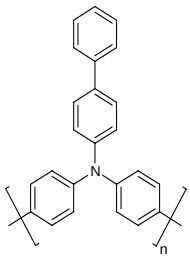
PTPA2



PTPA3

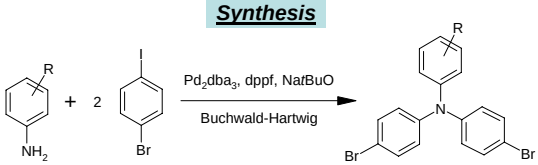


PTPABu



PTPAPh

Synthesis

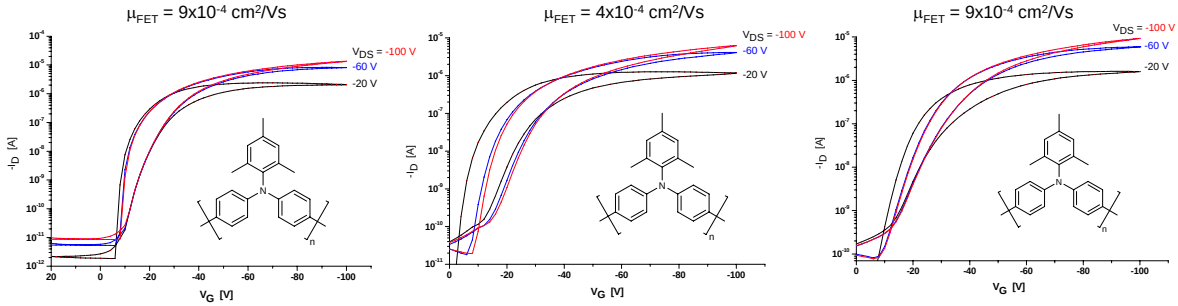


	PTPA1	PTPA2	PTPA3	PTPABu	PTPAPh
M_n	2300	5000	37600	8700	3800
M_w	7100	26200	68700	21400	9982
PD	3,1	5,2	1,8	2,5	2,6

	PTPA1	PTPA2	PTPA3	PTPABu	PTPAPh
Mobilities [cm²/Vs]	$1x10^{-3}$	$5x10^{-4}$ [a]	$9x10^{-4}$	$1x10^{-4}$	$1x10^{-5}$
On/Off	10^3	500 [a]	10^5	10^4	10^4
Band Gap [eV]	3.25	3.27	3.21	3.17	3.17
HOMO Level [eV]	X	X	5.06	5.12	5.16

[a] Data taken from [iii]

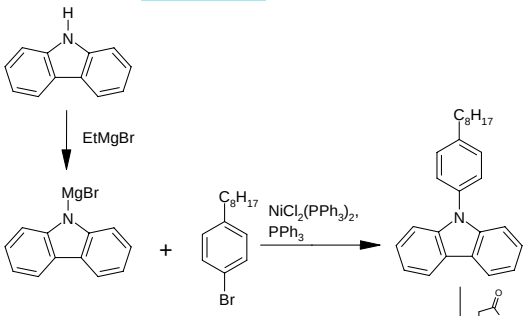
Stability Measurements:OFET Characteristics PTPA3 (ITO/PTPA3/Au) (Transfer - channel length 10 μm)



6 weeks in glove box → 2 days at ambient conditions → Annealed for1 h at 100 °C

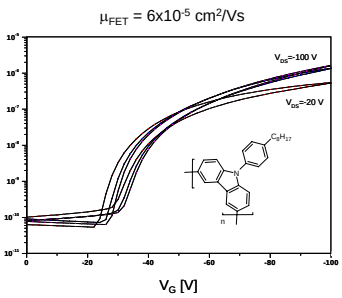
Poly(carbazole) (PCPN8)

Synthesis

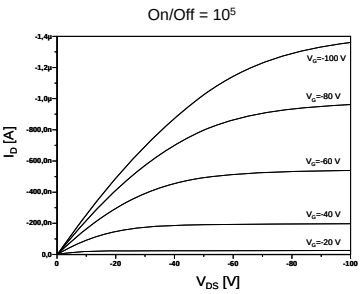


PNPC8	
M_n	4700
M_w	6000
PD	1,3

OFET Characteristics: (ITO/PCPN8/Au)



Transfer (channel length 10 μm)



Output (channel length 10 μm)

References:

[i] Veres, J., Ogier, S., Leeming, S., Brown, B., Cupertino, D., *Mater. Res. Soc. Proc.*, **2002**, *708*, 243

[ii] Kempa, H., Reuter, K., Bartzsch, M., Hahn, U., Huebler, A.C., Zielke, D., Forster, M., Scherf, U., Proc. IEEE Polytronic Conference **2005**

[iii] J.A.V. Allen, B.A. Brown, S.W. Leeming, J.D. Morgan, J. Veres, *WO Patent 00/78843 A1*, **2000**

Thanks! degussa. creating essentials

Heiko Thiem

Science to Buisness Center, Marl for OFET Measurement