

#### CD-I-4

### Sulfonated Polyaniline as Hole Injection Layer in Polymeric Diodes – comparison with PEDOT:PSS

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In organic devices the current during operation is limited either by electrode/organic semiconductor interface or by organic semiconductor bulk characteristics. At low applied voltages the charge transport is limited by the potential barrier at the interface, whereas at higher applied voltages the transport commonly becomes limited by space-charge accumulation, due to the low charge carrier mobility values normally observed in these materials<sup>1,2,3,4</sup>. In several cases PEDOT:PSS (poly (3,4-ethylene dioxythiophene) : poly (styrenesulfonate)) was successfully used as an intermediate layer, between metal or indium-tin-oxide (ITO) electrode and electroluminescent polymer, in order to effectively reduce the energy barrier for positive charge injection<sup>5,6</sup>. In this work we report the use of SPAN (Fig. 1) as hole transporting layer, demonstrating that it can be used to significantly improve hole injection in diodes.

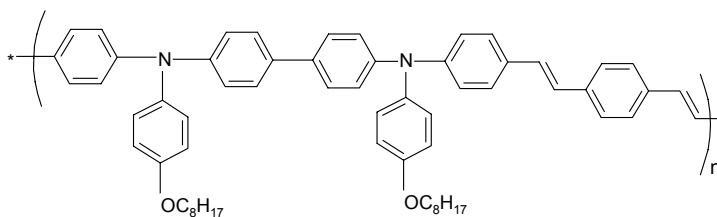


Fig. 1 – Chemical structure of the Sulfonated Polyaniline

The SPAN films are grown electrochemically onto ITO and TO (tin oxide) substrates and used as the anode in diodes<sup>7</sup>. Tin oxide, Indium tin oxide, SPAN and PEDOT:PSS performance as hole-transporting layer material are compared in current

voltage characteristics for diodes constructed using a poly(3-hexylthiophene) P3HT and an alternating copolymer, (N,N'-diphenyl-N,N'-bis(3-methylphenyl)-1,1'-biphenyl-4,4'-diamine)) TPD-PV<sup>8</sup>, as the active layers. The current-voltage characteristics were measured with *Keithley electrometer 2000*, in dark and under inert atmosphere.

Emeraldine base polyaniline with different counter ions was also proposed as an alternative to PEDOT:PSS as hole-transporting layer<sup>9</sup>. SPAN has the advantage that it is a single component material, potentially reducing the possibility of occurrence of problems originated from phase segregation of the hole-transporting layer components.<sup>10</sup> Compared to polyaniline (PANI), SPAN has additional advantages: it is mostly amorphous, it remains self-doped even in vacuum and, it presents higher thermal stability<sup>11</sup>.

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