"Modification in optoelectronic characteristics of organic light emitting diodes (OLEDs) by using triarylsulfonium salts"

SHORT ABSTRACT

Objective of this dissertation is the investigation of modification in the optoelectronic characteristics of Organic Light Emitting Diodes (OLEDs) by using triphenylsulfonium (TPS) salts. TPS salts are well-known photoacid generators and they have been implemented in organic electronic devices in order to fabricate pixilated matrix displays or solution-deposited multilayered OLEDs by applying photolithography techniques.

Firstly, the effect of *TPS-salts addition in the active layer* on the optoelectronic properties of OLEDs was studied for the cases of a *yellow-emitting* and a *blue-emitting* polymer matrix. It was found that, both the ionic nature of TPS-salts as well as the extended charge delocalisation over the benzene rings influence the injection of charges from the electrodes and their transport through the polymer layer. Next, *the deposition of TPS-salts on top of the polymer layer from their solution in orthogonal solvents* revealed the potential of these compounds to efficiently act as *Electron Injecting Layers (EILs)*. It was found that the enhancement of the injection of electrons upon utilization of such polar interfacial layers was, mainly, due to the favourable redistribution of the internal field and the subsequent reduction of the cathode effective work function. Finally, the photochemically induced patterning of different colour areas in a single polymer layer was achieved. The *colour tuning of phosphorescent emitters,* in particular Platinum and Iridium complexes, was demonstrated for the first time. These complexes were able to change their emission colour following protonation of their basic site by the acid generated upon exposure of the TPS-salts in UV radiation.

The methodological approach involved: (a) the spectroscopic and voltametric study of the electronic structure of TPS-salts and polymers and the electronic transitions of the complex polymeric films, (b) the films surface investigation with atomic force and scanning electron microscopies and (c) OLED fabrication and extensive optoelectronic characterisation.

In conclusion, it was shown that triphenylsulfonium salts are ionic compounds with attractive photophysical and photochemical properties that can be easily implemented in high performance organic optoelectronic devices. The TPS-salts presented in this work can act as model compounds for future optimization of their functional properties through proper selection of both anions and cations and fine-tuning of their energy levels.