Hybrid nanoarchitectures for PhOLED devices

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Tunable nanomaterials with optical and electronic properties play a leading role in many applications as flexible displays and white light-emitting sources. Aim of this work is the design and the realization of novel phosphorescent nanomaterials where dopant molecules are organized into conducting polymer nanostructures. We have realized Phosphorescent Organic Light Emitting Devices (PhOLED) composed of poly(9-vinylcarbazole) (PVK) nanostructures doped with Iridium(III) complexes emitting in the red, green and blue region of the visible spectrum. We employed two different kinds of nanostructured systems: PVK nanoparticles (NPs) and core–shell nanoparticles where a shell of PVK surrounds the surface of polypyrrole (PPy) NPs [1]. The hetero-structures were built using the sequence schematically reported in figure 1.

Successful doping of the PVK NPs with Ir(III) complexes was obtained by the reprecipitation method as shown by electronic spectroscopy. The combination of different techniques, i.e. particle sizing, AFM and zeta-potential measurements showed that the dimensions and morphology of the aggregates correlate with the structure and concentration of the specific Iridium complex used.

The photophysical characterization of the PVK/Ir NPs demonstrated the occurrence of the desired energy transfer process between PVK and the Iridium complexes both in aqueous suspension and after deposition on solid supports.