Charge Transport Studies on Poly(*o*-alkoxyanilines) Nanostructured Films: Formation of Conducting Islands

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Abstract

The mechanisms for charge transport and the nature of the charge species have been controversial. Here we propose a structural model for poly(*o*-alkoxyanilines), where the conduction process is governed by nanocarriers or *quasi*-particles with concomitant hopping and tunneling between conducting islands.

The purpose of this work is to investigate the types of charge carriers and its role in transport of electricity in conducting polymers, in special, polyanilines. We present the transport studies of one model “metallic” conducting polymer named “conducting islands” [1,2]. Since it is known that electronic properties of conducting polymers has several controversies electron paramagnetic resonance (EPR), Raman and X-ray photoelectron spectroscopy (XPS) measurements, besides molecular modeling have been carried out in order to remove some ambiguity concerning the occurrence of conducting states. The metallic islands are coupled into the network with the twisted and tangled polymer chains. We shown the formation of *charge carriers* in poly(*o*-alkoxyanilines) using EPR, which to support the presence of two types of *charge carriers* in poly(*o*-alkoxyaniline) solutions for an intermediate pH value (pH=5.0). The first type is localized in the amorphous part and with small mobility, while the second is delocalized in the semi-crystalline part with high mobility. Using small-angle X-ray scattering (SAXS) we confirm the existence of *quasi*-particles in solution, corroborated by a*b initio* procedures based on simulated annealing. The model also indicates that the *quasi*-particles may jump between defects along the polymer chain providing electronic conduction, which are consistent with molecular modeling results. However, it does not discard the hopping process between neighboring chains.

References

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