Technology and properties of polyazomethines thin films

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Abstract

Purpose: *The objective of this paper is to carry out an analysis of the having so far been received results of investigating on polyazomethine thin films for their applications in photovoltaic devices and finding out any relations connecting film: morphology, structure and optical properties, as well as describing electronic structure of polyazomethines of various chain backbone and both doped and protonated polyazomethines based on the model of electronic structure of PPI thin films.*

Design/methodology/approach: *Polyazomethine thin films have been prepared using the methods of chemical vapour deposition, physical vapour deposition and spin-coating based on polycondensation of aromatic diamines and dialdehydes and thin films of polyazomethines with side chains prepared by spin-coating from solution in organic solvent. The results having so far been prepared were published, however, gaining knowledge of phenomena going on requires for the results were collected and analysed critically whether electronic and optical properties of polyazomethine thin films can be controlled by means of the film morphology.*

Findings: *It was found out that within π electron approximation one can describe the electronic structure of polyazomethine PPI, and give an account of observed variations of the optical spectra in case of soluble polyazomethine with side chains, and the spectrum variation due to doping or protonation. While using this model one can interpret optical spectra of polyazomethines having oxygen atoms or various aromatic units in the backbone.*

Research limitations/implications: *Some limitation of the used methods of preparing polymer thin films from vapour phase is technique of producing bulk p-n junction as a film with organic*

molecules homogeneously spread over throughout polymer matrix, and in case of soluble polyazomethines the limitation is the same. Other limitation seems to be aromaticity of benzene ring, its coupling with lone pair on trigonal orbital of nitrogen atom. May be some additional limitation in this sense is chain character of conjugated polymers, making them one dimensional conductor wire.

Practical implications: *It is expected the results of this paper can be used to working out technology of producing high performance organic solar cells or electroluminescent diodes.*

Originality/value: *It has been proven that the elaborated model of the electronic structure of thin films of polyazomethine PPI, whose the backbone is composed of alternately distributed phenylene rings connected at para positions (1,4) with azomethine linkages can be used successively to interpret optical effects driven by doping or protonating these layers, in case of prepared by spin-coating from solutions it explains differences observed in the shape of optical spectra taken on PPI and BOO-PPI as well as polyazomethines containing bifphenyl, fluorene or naphthalene entities in the backbone.*

Keywords: *Polymer materials, Thin polymer layers, Polymeric solar cells, Optoelectronic properties of organic photovoltaic structures*

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