Conductive polymer growth onto radiation grafted polyolefines

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It is forecast that traditional polyolefins will gradually lose their pricing power, substituted by biodegradable, natural source polymers in mass production packaging or agricultural films, due to the environmental concerns related to post-use of non-degradable, oil-based plastics, or wedged between the demands of upstream oil and gas corporations and the declining prices for finished goods from the major retail chains. Increases in consumption will continue to be driven only by novel applications, where plastics can deliver performance enhancements at a reasonable cost. Often, though, other functional properties will be required, beside the unparalleled chemical resistance and mechanical properties. In order to retain most of the properties of polyolefins, composite nanostructures with other functional materials can be pursued. Polyaniline is a well-known conducting polymer with an excellent compromise between performance and costs. In particular, electrical conductivity induced by Brønsted acids doping, chemical and solvent resistance makes it an interesting material component in a variety of electrical devices, and particularly chemical and biosensors and energy storage devices. Here we propose a facile multi-step process to generate polyaniline/polypropylene skin-core hybrid films. Acrylic acid (AA) is grafted on polypropylene (PP) films through high energy irradiation processing. Carboxyl groups grafted on PP films are then derivatised into primary amino groups and an electro-active PANI skin is thus chemically grown onto these substrates, via in-situ chemical oxidative polymerisation, leading to strong modifications of the optical, electrochemical and electrical properties of the flexible hybrids. The nature of the attachment of the conjugated polymer thin layers on the film surfaces will be discussed, together with the specific optical, electrical and electrochemical properties that the conjugated polymer confers to the polyolefin films.

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