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CHEMICAL DESIGN OF FLEXIBLE SKIN-CORE POLY(ETHYLENE-CO-ACRYLIC ACID)/ NANOSTRUCTURED POLYANILINE HYBRIDS

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Surface modification of polymeric films is a way to obtain final products with high performance for many specific and ad hoc tailored applications, e.g. in "functional" packaging, tissue engineering or (bio) sensing. The present work reports for the first time on the design and development of surface modified ethylene-acrylic acid copolymer (EAA) films or wires with polyaniline (PANI), with the aim of inducing electrical conductivity. In this contribute, we demonstrate that PANI was successfully polymerized and covalently grafted onto the flexible EAA substrates, previously activated. The mechanical properties of the films are not detrimentally affected by each treatment step, while a significant increase in electrical conductivity was achieved for the new hybrid materials. FT-IR (Perkin Elmer) spectroscopy was used to characterize the samples after each step. X-ray Photoelectron Spectroscopy (XPS) was performed to further support the presence of PANI on top of the EAA substrates. SEM FEI QUANTA 200F was used for the morphological characterisation. The tensile tests were conducted, according to ASTM D882, by using a Zwik/Roell Z005. Conductivity measurements were carried out via Impedance Spectroscopy by means of a Frequency Response Analyser. The PANI particles obtained have a typical average size of a few tens of nanometers and are thus often regarded as nanogranular typical morphology of PANI polymerized in a strongly acidic solution. All characterization data strongly suggest that PANI was successfully polymerised and covalently grafted onto the flexible EAA substrates. There are no significant differences after each treatment in the mechanical properties, except a faint decrease of the elongation at break. The electrical conductivity shows values of 1*10-4 S/m for the PANI-based hybrid systems drastically enhanced if compared with 10-13 S/m value of the neat EAA.