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SURFACE MODIFICATION OF POLY(ETHYLENE-CO-ACRYLIC ACID) WITH AMINO-FUNCTIONALIZED SILICA NANOPARTICLES

R. Scaffaro [a,*], L. Botta[a], A. G. Lo Re[a], R. Bertani[b], R. Milani[b], A. Sassi[c]

[a] Dipartimento di Ingegneria Chimica, Gestionale, Informatica, Meccanica, Università di Palermo, *Viale delle Scienze, Ed. 6, 90128 Palermo, Italy,* [b] *Department of Chemical Processes of Engineering, University of Padova, Via F. Marzolo 9,I-35131, Padova, Italy,* [c] *CNR-ISTM, Institute of Molecular Sciences, c/o University of Padova, Via F. Marzolo 1, I-35131, Padova, Italy*

**Corresponding author: roberto.scaffaro@unipa.it*

The surface properties and their tuning, with the aim to increase the versatility of the material, attracted a large interest both from a scientific and a technological point of view. Silica nanoparticles are used for several applications: as filler in polymer nanocomposites, as scratch resistant coatings, for bionanotechnology applications and for the modification of wettabilty of textile fibers. The surface modification by formation of covalent bonds between the suitably activated polymeric substrate and SiO2 nanoparticles with different terminated groups appears an intriguing strategy to tune surface properties such as chemical, physical and mechanical properties of the starting material. In this work, we studied the possibility to achieve an hybrid-surface through the modification, via a facile wet chemical process, of the surface of films of poly(ethylene-co-acrylic acid) (EAA) with amino-modified silica nanoparticles. Films of EAA were preliminarily activated by the introduction of -COCl groups on their surface. Silica nanoparticles were thereafter covalently bound on the polymeric surface as confirmed by FTIR, ATR-FTIR, XPS, NMR and SEM determinations. The nanoparticles formed a multilayer on the film surface of about 1.5 microns and covered almost uniformly the whole film surface. Direct measurements of superficial amino groups by titration allowed to detect a concentration of about 18 nmol/cm2. The presence of this uniform layer of nanoparticles bearing polar groups strongly changed the wettability of the material as confirmed by static contact angle measurements that passed from 87° of neat EAA to about 30° of the amino-functionalized silica nanoparticles modified material.