

Polymer Science

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In the labs of the Polymer Science group, different kinds of polymers and nanocomposites are studied, focusing particularly on their morphological and structural aspects (crystallization, lamellar morphology, polymorphism). The study, conducted on different scales, allows to obtain a global and complete picture of the considered materials. In fact, by wide angle X-ray diffraction (WAXD) the molecular structure, the type of crystalline cell and the dimensions of crystallites are studied, by small angle X-ray scattering (SAXS) and electron microscopy the lamellar morphology is investigated. From acquired diffractograms, in order to obtain the crystallinity degree, lamellar thicknesses and distributions, sophisticated computer software is used. Once characterization data have been obtained as a function of process or formulation parameters, the influence of these latter factors on polymer morphology and physical-mechanical properties is determined, with the purpose of obtaining a structure-property correlation to be used in the design of materials. The study is completed by thermal analysis (DSC and simultaneous DSC-TGA) and optical microscopy. Besides composite polymeric fibers are prepared via electrospinning, using as fillers: silver particles, clays, carbon nanotubes, carbon quantum dots, graphene and others.

- *Nanocrystalline cellulose-fullerene: Novel conjugates*, Carbohydrate Polymers, **2017**, 164, 92-101.
- *Neuronal commitment of human circulating multipotent cells by carbon nanotube-polymer scaffolds and biomimetic peptides*, Nanomedicine, **2016**, 11, 1929-1946.
- *Synthesis and photochemical applications of processable polymers enclosing photoluminescent carbon quantum dots*, ACS nano, **2015**, 9, 4156-4164.
- *Covalent functionalization enables good dispersion and anisotropic orientation of multi walled carbon nanotubes in a poly(L-lactic acid) electrospun nanofibrous matrix boosting neuronal differentiation*, Carbon, **2015**, 95, 725-730.
- *Characteristics of TEMPO-oxidized cellulose fibril-based hydrogels induced by cationic ions and their properties*, Cellulose, **2015**, 22, 1993-2010.