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Spectroscopic tools to study and interpret macromolecular dynamics at a molecular scale

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In Polymer Science, knowing macromolecular chains dynamics (i.e. how and why they move) is one of the most important issues to understand properties of polymers. In this sense, a good starting point might be to know if certain motions of a group or groups of atoms is the main driving force of the polymer dynamics. Therefore, instruments capable of extracting information at a local scale are essential to carry out these studies. However, the most conventional techniques used to give information about polymers dynamics are based on signals coming from changes occurring in the sample as a whole. This is the case of the differential scanning calorimetry, DSC, which measures changes in the heat capacity or the dynamic mechanical analysis, DMA, which monitors the change in the modulus of a material. Although in both cases results can be interpreted from changes in the local dynamics, the direct information from those molecular sites are not actually obtained. In fact, the deductive thought starts from a macroscopic information given by the experiments whose molecular origin will be speculations the most of times. Therefore, the way of avoiding this kind of speculations would be to achieve information at a molecular scale sensitive to the polymers relaxations or to the motions of polymers chains. Infrared spectroscopy and fluorimetry by using fluorescent labels seem to be the answer since they are very easy handling and low cost techniques. In polymers spectroscopy the study of band shapes and widths is a common practice since they are related to the distribution of different local environments experienced by the absorbing or emitting groups. In this communication, by using some examples, useful basics about infrared spectroscopy and fluorescence will be given in order to study and interpret macromolecular dynamics in polymers and polymer composites.

Biography

Jorge Teno Díaz received his degree in Materials Engineering in 2013 from the University Rey Juan Carlos (Spain). He received his master degree also in Structural Materials for New Technologies in 2014 from the University Rey Juan Carlos and University Carlos III of Madrid. Since 2015 Jorge Teno Díaz is doing his Ph.D. in Materials Science and Engineering Department from University Carlos III of Madrid in the research group of Professor González-Benito. His current research activities focus on characterization of nanocomposite materials produced by Solution Blow Spinning technique, using a variety of microscopic imaging methods, FT-IR spectroscopy and fluorescence based methods.

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