NEW BIODEGRADABLE AND FUNCTIONAL POLYMERS FROM EASILY AVAILABLE SUGARS

Juan A. Galbis

Department of Organic and Pharmaceutical Chemistry, University of Seville, 41071 Seville (Spain).
jgalbis@us.es

The environmental impact produced by the massive use of the plastic materials mostly synthesized from monomers obtained in the petrochemical industry from the fossil resources and the everyday more restricted access to these resources have drawn attention to natural renewing sources for the chemical synthesis of polymers. The polymers based on naturally occurring products are promising, new materials, with novel technical possibilities and improved properties, such as biocompatibility and biodegradability.[1] Among the different natural sources, carbohydrates stand out as highly convenient raw materials because they are inexpensive, readily available, and provide great stereochemical diversity.[2]

Aliphatic polyamides (nylons®), aromatic polyesters (PET and PBT), polycarbonates and polyurethanes are widely recognized polymers because of their excellent technical properties. However, the low hydrophilicity, resistance to hydrolysis, and lack of biodegradability displayed by these polymers are serious shortcomings that limit their applications and make their recovery by chemical recycling difficult. In earlier papers published by our group[3-6] we described the preparation and characterization of carbohydrate-based AB-type and AABB-type polymers having an enhanced hydrophilicity and biodegradability.

In this lecture, I will present the last results obtained in our group on the preparation of new carbohydrate-based polymers obtained by polycondensation and polyaddition reactions, their structures and properties.

[1] Vert, M., Feijen, J., Albertsson, A., Scott, G., Chiellini, E., Eds. *Biodegradable Polymers and Plastics*, The Royal Society of Chemistry, Cambridge, UK., **1992**.

[2] Galbis, J. A., García-Martín, M. G. *Sugars as Monomers*. In: A. Gandini, M. N. Belgacem, Eds. *Monomers, Oligomers, Polymers and Composites from Renewable Resources*. Elsevier, Amsterdam, **2008**. (Chapter 5). pp. 89-114.

[3] Alla, A., Hakkou, K., Zamora, F., Martínez de Ilarduya, A., Galbis, J. A., Muñoz-Guerra, S. *Macromolecules* **2006**, *39*, 1410-1416.

[4] De Paz, M. V., Marín, R., Zamora, F., Hakkou, K., Alla, A., Galbis, J. A., Muñoz-Guerra, S. *J. Polym. Sci., Part A: Polym. Chem.* **2007**, *45*, 4109-4117.

[5] De Paz, M. V., Aznar, J. A., Galbis, J. A. *J. Carbohydr. Chem*. **2008**, *27*, 120-140.

[6] Zamora, F., Hakkou, K., Alla, A., Marín, R., De Paz, M. V., Martínez de Ilarduya, A., Muñoz-Guerra, S., Galbis, J. A. *J. Polym. Sci., Part A: Polym. Chem.* **2008**, *46*, 5167-5179.