

# International Conference and Exhibition on **Biopolymers & Bioplastics**

August 10-12, 2015 San Francisco, USA

## **Low temperature lipase-catalyzed synthesis of renewable functional telechelicpolyesters in supercritical CO<sub>2</sub>**

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The use of green monomers for the replacement of fossil-based raw materials is an attractive research subject of modern polymer science. To achieve a completely green process, enzymes have been investigated as polymerization catalysts. Unfortunately, the high melting point (>105 °C) of some di-acids and their insolubility in non-polar solvents necessitate the use of their esters and limits the range of natural monomers that could be used without pre-modification. Moreover, the use of high temperature is expensive and can lead to side reactions and enzyme deactivation. Here we show that scCO<sub>2</sub> can overcome these issues. In recent years the interest on the use of scCO<sub>2</sub> as a medium for polymer synthesis and processing has increased steeply. ScCO<sub>2</sub> is able to plasticize many polymers at temperatures below their glass-transition temperature and melting point, therefore opening new opportunities for polymer synthesis and modification. Here we investigate the poly-condensation of bio-based commercially available long-chain di-acids and diols under scCO<sub>2</sub>. Telechelic polyesters with targeted molecular weight were synthesized by end-capping the chains with functional molecules. The use of scCO<sub>2</sub> as a reaction medium allowed for the use of *Candida Antarctica Lipase B* (CaLB) as a catalyst at a temperature as low as 35°C. Thus, easily preserving the functionality of the end-capper and the enzyme activity, so that it can be then recycled. The products, obtained with good yields, have been characterized to assess their structural and thermal properties. Finally, the telechelic chains were cross-linked to form useful naturally derived films.

### **Biography**

Silvio Curia originates from Cosenza (Italy). He obtained his Laurea Magistrale in Materials Science from the University of Milano working on the preparation of polymer nanocomposites for controlled light diffusion (March 2012). He joined Prof Steve Howdle's group at the University of Nottingham in September 2012. His PhD project is part of the REFINE network and he is investigating the use of scCO<sub>2</sub> for renewable polymeric materials synthesis and materials processing. In 2014 he gave a talk at the European Meeting on scFluids in Marseille and presented a poster at the Gordon Research Conference on Green Chemistry in Hong Kong.

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