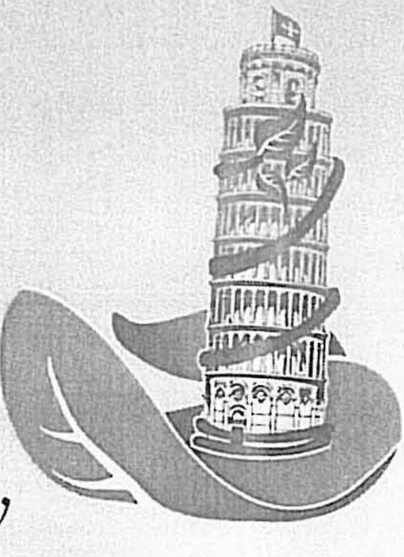
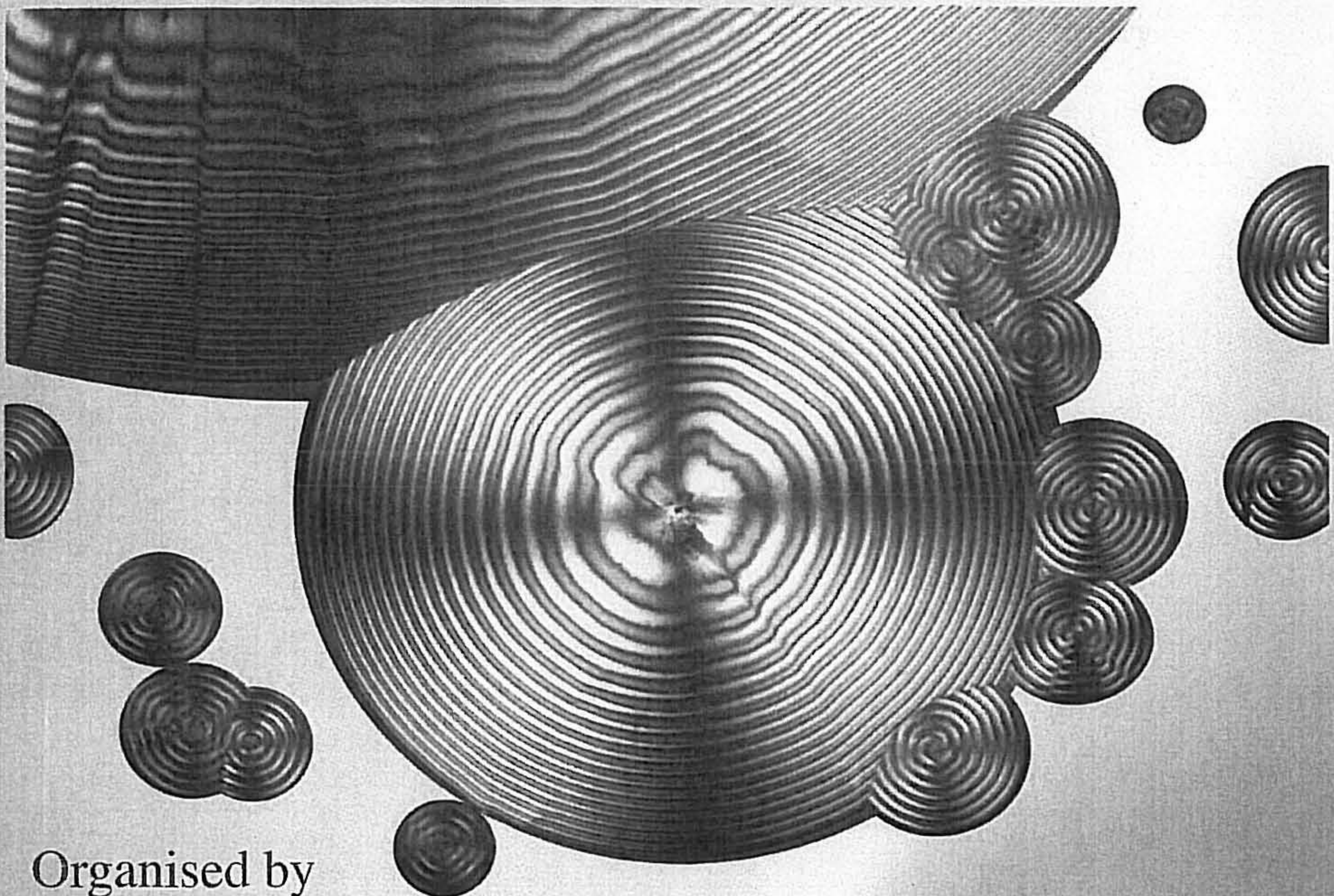
4th Workshop



Green Chemistry and Nanotechnologies in Polymer Chemistry

4-6 September 2013 – Pisa, Italy



Organised by

Department of Civil and Industrial Engineering,
University of Pisa
Institute for Composite and Biomedical Materials, CNR
National Interuniversity Consortium of Materials Science and Technology, INSTM

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4TH WORKSHOP GREEN CHEMISTRY AND NANOTECHNOLOGIES IN POLYMER CHEMISTRY

4-6 September 2013 – Pisa, Italy

OFFICIAL PROGRAM

	Wednesday, 04.09.2013
17.00-19.00	Registration
19.00-21.00	Welcome Reception
	Thursday, 05.09.2013
8.30-13.00	Registration
9.00-9.20	Welcome and Opening
	Session A - Green Chemistry
09:20 CO01	**Matjaž Kunaver** Biomass waste - A source of raw materials
09:40 CO02	**Mikelis Kirpluks** High Density Rigid Polyurethane Foams from Renewable Materials for Automotive Application
10:00 CO03	**Claudia Crestini** Ultrasound assisted production of biocompatible lignin core-shell micro/nanocapsules for storage and delivery of hydrophobic molecules
10:20 CO04	**Aiga Paberza** Flammability and thermal properties of rigid polyurethane foams obtained from oxypropylated lignin
10:40 CO05	**Tomáš Vlček** Coatings with enhanced properties and prolonged lifetime
	11.00-11.30 Coffee break
11:30 CO06	**Aleksandra Gawełczyk** Depolymerization of polycarbonate by castor and rapeseed oils
11:50 CO07	**Anda Fridrihsone** Post curing kinetics of VOC-free, 100 % solids, spray-applied polyurethane coatings from rapeseed oil polyols
12:10 CO08	**Hilda Gómez Bernal** Corn stover valorization to high energy furan liquids by microwave assisted autohydrolysis
12:30 CO09	**Datta Janusz** Thermo dynamical and mechanical characterization of polyurethanes synthesized using glycolysates intermediates
12:50 CO10	**M. Filomena Barreiro** Chemical modification as a strategy to modulate properties of oxypropylated products
	13.10-14.00 Lunch
	14.00-15.00 Poster session.
	Session B – Nanotechnologies
15:00 CO11	**Ivan Kelnar** Effect of chitin nanofibrils/ plasticizer combination on mechanical behaviour of chitosan-matrix films
15:20 CO12	**PierFrancesco Morganti** Chitin nanofibrils: a multifunctional biomaterial of marine origin
15:40 CO13	**Jana Mikešováa** Rheological properties of chitosan solutions filled with chitin nanofibrils
16:00 CO14	**Galina Tishchenko** Biodegradable composite films from chitosan and chitin nanofibrils

ORAL

4TH WORKSHOP GREEN CHEMISTRY
AND NANOTECHNOLOGIES IN POLYMER CHEMISTRY
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CHEMICAL MODIFICATION AS A STRATEGY TO MODULATE PROPERTIES OF OXYPROPYLATED PRODUCTS

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Concept and objectives

Nowadays a great interest is devoted to the production and use of biobased products. The main scope of the oxypropylation process is to obtain polyols, in the form of viscous liquids, which can be interesting co-monomers to produce polyurethanes and polyesters. Due to the high hydroxyl content of natural polymers (suitable substrates to be oxypropylated), the generated polyols are multifunctional, hence most adequate to be used in rigid polyurethane foam formulations. Additionally, their properties can be modulated through chemical modification, thus opening new avenues for their exploitation.

Following that strategy, an oxypropylated product (I_{OH} of 350) used as a model polyol, was modified by reacting it with a mixture containing phenyl isocyanate (PI) and toluene diisocyanate (TDI) at PI/TDI molar ratios of 100/0, 80/20, 50/50, 20/80 and 0/100. This chemical system was chosen in order to guarantee a homogeneous medium during the course of the reaction. Syntheses were performed in dichloromethane solution at room temperature under nitrogen, using DBTDL as catalyst, with a reaction time of 6 hours.

Kinetics was followed by FTIR in transmittance mode using a liquid cell equipped with NaCl windows. For that purpose, sample aliquots were taken from the reaction medium at time intervals of 10 minutes during the first hour, 30 minutes during the second hour and at one hour intervals until the end of the reaction. After the established reaction time of 6 hours, residual isocyanates were neutralized with methanol and the final product purified, dried and characterized by FTIR and DSC.

Results and Discussion

Figure 1 shows a typical plot of a FTIR experiment. Quantification of the isocyanate group conversion was estimated from the isocyanate absorption band (2270 cm^{-1}) intensity decay. It was observed that as the PI/TDI molar ratio decreased, i.e, as the content of the difunctional monomer increased, the final isocyanate conversion (time = 360 min) decreased and the polymer Tg shifted towards higher values, thus corroborating an increase in the crosslink density. An increase of crosslinking density introduces restrictions on the molecular motion lowering NCO conversion and increasing the Tg value. In fact the produced polyurethanes changed from a highly viscous liquid (PI/TDI=100/0 and 80/20) to stiff solids (PI/TDI=50/50, 20/80 and 0/100). In conclusion, the strategy used in this work demonstrates a way to modulate the final properties of the oxypropylated products.

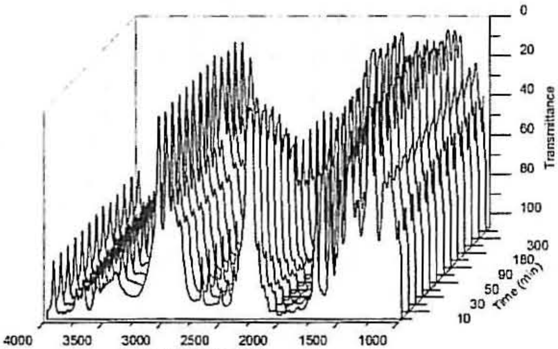

Figure 1. Typical FTIR plot.

Aknowledgments

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