Niccolò Braidi

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WORK EXPERIENCE

09/12/2020 – CURRENT
PHD STUDENTS REPRESENTATIVE – UNIVERSITY OF MODENA AND REGGIO EMILIA

01/11/2020 – CURRENT – Modena, Italy
PHD STUDENT IN MODELS AND METHODS FOR MATERIAL AND ENVIRONMENTAL SCIENCES – UNIVERSITY OF MODENA AND REGGIO EMILIA

Under the supervision of professor F. Ghelfi, I'm working on the anomalous branching of styrene during ARGET ATRP.

03/02/2020 – 03/08/2020
RESEARCH SCHOLARSHIP – UNIVERSITY OF MODENA AND REGGIO EMILIA

The main tasks, in no particular order, were:

- Laboratory work: synthesis (in a Schlenk tube with ATRP ARGET reagents), post-reaction treatments (precipitation in methanol and gel microtomy) and characterization (swelling, GPC and SEM) of linear and cross-linked polystyrene samples.
- Analysis of recorded data: determination of precision, univariate regression and analysis of the main components using a chemometric toolbox (PLS_toolbox for MATLAB).
- Write periodic reports, a poster for a convention (MIPOL2020)and a first scientific paper first draft.
- Plan future experiments following a Design of Experiments approach: fractional factorial and D-optimal.
- Interact regularly with our collaborators (ENI "Versalis" and the Department of Chemistry at the University of Bologna).

Modena, Italy

07/2018 – 12/2019
MEMBER OF THE JOINT COMMISSION (CPDS) – UNIVERSITY OF MODENA AND REGGIO EMILIA

Tasked to: monitoring the University's educational offer, teaching quality and student services; as part of the Quality Assurance System.
The activity was carried out by interviewing students, examining the relevant documentation and attending meetings aimed to produce a periodic report.

Modena, Italy

EDUCATION AND TRAINING

09/2006 – 06/2011 – Modena, Italy
SECONDARY SCHOOL DIPLOMA IN CHEMISTRY – I.T.I.P. "E. Fermi"

final score: 97/100
Curriculum:

- General Chem.
- Organic Chem.
- Physical Chem.
- Analitical Chem.
- Industrial Chem.

Extracurriculum:
"Cometa project" for motivated students, in collaboration with the University of Modena and Reggio Emilia. Lessons and supervised laboratory work as a first universitary experience.

EQF level 5

09/2011 – 04/2016 – Modena, Italy
BACHELOR'S DEGREE IN CHEMISTRY – Univeristy of Modena and Reggio Emilia

final score: 97/110
Curriculum:

- Organic Chem. I, II and Applied
- Physical Chem. I and II
- Analytical Chem. I and II
- Inorganic Chem.
- General Chem.
- Environmental Chem.
- Environmental and Industrial Chem.
- Math I and II
- Physic I and II
- Informatic
- English

EQF level 6

09/2017 – 12/2019 – Modena, Italy
MASTER'S DEGREE IN CHEMICAL SCIENCES – Univeristy of Modena and Reggio Emilia

final score: 110/110 cum laude
Curriculum:

- Advanced Organic Chem.
- Higher Inorganic Chem.
- Physical Chem. of Complex Systems
- Chemometrics
- Science and Technology of Polymeric Materials
- Organic Chem. of Macromolecules
- Instrumental Analytical Chem.
- Physical Chem. and Molecular Spectroscopy
- Solid State Chem.
- English

EQF level 7

LANGUAGE SKILLS

Mother tongue(s): ITALIAN

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C1	C1	B1	B2	C1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Microsoft Word | Microsoft Excel | Microsoft Powerpoint

PUBLICATIONS

Paper: Copper catalysed ARGET ATRP of styrene in EtOAc/EtOH using only Na2CO3 to promote the catalyst regeneration

-Paper accepted, in print-
2021
A CuCl2/tris(2-pyridylmethyl)amine (TPMA) (1/1) catalysed “activator regenerated electron transfer” “atom transfer radical polymerisation” (ARGET ATRP) process in ethyl acetate/ethanol (EtOAc/EtOH) for the polymerisation of styrene from ethyl 2,2-dichloropropanoate (EDCP) is described. The (re)generation of the cupric complex is accomplished by Na2CO3 without the addition of any explicit reducing agent. Differently from the analogous process operating with the reducing pair ascorbic acid/carbonate, branching is no more present and control over polymerisation is much better. The activation mechanism should follow a composite route, where both the oxidations of EtOH and of TPMA take part to the regeneration of the catalyst. The oxidation of TPMA is suggested by the absence of the nitrogen ligand in the final reaction mixture and by the reduction of CuII even in t-BuOAc/t-BuOH, notwithstanding t-BuOH is a very poor reducing agent. The oxidative degradation of TPMA causes a progressive malfunctioning of the redox catalyst. As a consequence, the polymerisation rate, after a prompt start, becomes slower and slower, fixing conversions around 50% (4.5 h). This prevents the superimposition between step-growth and chain processes. In fact, the gradual decrease of free radicals concentrations develops unfavourable conditions for the reductive coupling (termination) between the bifunctional growing chains, preserving a controlled growth of the polymer.

Paper: Copper-Catalysed “Activators Regenerated by Electron Transfer” “Atom Transfer Radical Polymerisation” of Styrene from a Bifunctional Initiator in Ethyl Acetate/Ethanol, Using Ascorbic Acid/Sodium Carbonate as Reducing System

Macromolecular Research 2020, 28, 751–761
https://link.springer.com/article/10.1007/s13233-020-8091-3 – 2020
A new copper(II) chloride/tris(2-piridylmethyl)amine (1/1) catalysed “Activators Regenerated by Electron Transfer” “Atom Transfer Radical Polymerisation” (ARGET ATRP) process for the polymerisation of styrene is described. The salient features of the method are the simultaneous use of ascorbic acid (reducing agent) and Na_2CO_3 (basic agent), the employment of a bifunctional initiator (ethyl 2,2-dichloropropionate) and the utilisation of a green solvent mixture composed of ethyl acetate and ethanol (AcOEt/EtOH). Na_2CO_3 plays a central role since not only preserves the ligand from protonation, but it can also activate the reducing agent. The quantity of monomer in the reaction mixture, the AcOEt/EtOH ratio and the load of ascorbic acid/carbonate are important factors for achieving a regular transformation. Working at 100 °C and with a metal load of only 0.025 mol%, an almost perfectly controlled telechelic polystyrene is produced, provided that conversion is kept below 50%. If conversion is higher, the control is gradually lost due superimposition of a step-growth process to the main chain polymerisation process. Two interesting phenomena, encountered during this study, are activation of the redox complex by using only Na_2CO_3 and gelation of polystyrene at 60 °C.
https://link.springer.com/article/10.1007/s13233-020-8091-3

Poster: Anomalous Gelation During the ARGET ATRP of Styrene

pp. 59, Booklet of MIPOL2020, Virtual Milan Polymer Days–Virtual MIPOL2020
http://www.mipol.unimi.it/Booklet_MIPOL2020.pdf – 2020
Co-authors: Mirko Buffagni, Francesca Parenti, Aldo Longo, Angelo Ferrando, Franco Ghelfi

Poster: Anomalous Gelation During the ATRP of Styrene

pp. 39, booklet of "XIX Giornata della Chimica dell'Emilia Romagna"
http://www.dscg.unimore.it/site/home/news-ed-eventi/documento1006062903.html – 2019
Co-authors: Mirko Buffagni, Francesca Parenti, Aldo Longo, Angelo Ferrando, Franco Ghelfi

CONFERENCES AND SEMINARS

Conferences

Introduction to Atom Transfer Radical Polymerization ATRP
publication date Jun 3, 2019
A presentation about Atom Transfer Radical Polymerization. An introduction to the subject, it's challenges, goals, more common declinations and where it's located in the panorama of controlled/living polymerizations. The following has been presented during the course of a day about polymer properties and synthesis organized by professor F. Ghelfi of the University of Modena and Reggio Emilia, in collaboration with the research center of Eni-Versalis “C. Buonerba” of Mantova, the 3 of June of 2019.