



**10TH PAUL WALDEN SYMPOSIUM
ON ORGANIC CHEMISTRY**

Programm and Abstracts

Riga
June 15-16, 2017

Friday, June 16

- 9.00-10.00 **Professor Olafs Daugulis** (University of Houston, Houston, USA)
New methods for carbon-hydrogen bond functionalization
- 10.00-10.30 **Dr. Vilnis Liepiņš** (JSC Olainfarm, Olaine, Latvia)
The use of DoE in chemical process optimization
- 10.30-11.00 **Dr. Ronalds Zemribo** (Latvian Institute of Organic Synthesis, Riga, Latvia)
Discovery of Remeglurant, a potent and selective mGluR5 receptor negative allosteric modulator
- 11.00-11.30 Coffee break
- 11.30-12.30 Poster Session II
- 12.30-13.45 Lunch break
- 13.45-14.45 **Professor Roger Strömberg** (Karolinska Institute, Department of Biosciences and Nutrition, Huddinge, Sweden)
Modification and conjugation of oligonucleotides for development of oligonucleotide therapeutics
- 14.45-15.10 Coffee break
- 15.10-15.30 **Doctoral student Jevgeņija Lugiņina** (RTU)
Aziridine ring opening and other reactions in liquid sulfur dioxide
- 15.30-15.50 **Doctoral student Mārtiņš Otiņš** (Latvian Institute of Organic Synthesis, Riga, Latvia)
Towards spinning of artificial spider silk
- 15.50-16.30 **Dr. Helmārs Šmits** (Syngenta Crop Protection, Basel, Switzerland)
Agrochemical process research: synthesis of aryl 1,3-diones and stereoselective cyclopropanation
- 16.30-16.45 Closing remarks, Award ceremony for poster prizes

Table of contents

Lectures

Ērika Bizdēna. Purine functionalization <i>via</i> their diazido and bis-triazolyl derivatives.....	11
Valdis Kokars. Donor-acceptor type low molecular organic glasses and phosphorescent dyes applied for solution-processed photonic materials	12
Janis Jaunzems. Industrial fluorinations & organic fluorinated intermediates.....	14
Eriks Rozners. Amide-modified RNA: synthesis, structure and RNA interference activity	15
Kaspars Tars, Ilva Lieknina, Svetlana Kotelovica, Mihails Shishovs, Yi-Pin Li. Capsids of ssRNA phages: structural studies and development of vaccines.....	16
Andis Slaitas. Benzimidazoles as potential pain controllers	17
Olafs Daugulis. New methods for carbon-hydrogen bond functionalization	18
Vilnis Liepins. The use of DoE in chemical process optimization.....	19
Ronalds Zemribo. Discovery of remeglurant, a potent and selective mGluR5 receptor negative allosteric modulator	20
D. Honcharenko, M. Jezowska, A. Ghidini, C.S.J. Rocha, S. Milton, M. Murtola, C.I.E. Smith, M. Honcharenko, R. Strömberg. Modification and conjugation of oligonucleotides for development of oligonucleotide therapeutics	21
Jevgeņija Lugiņina. Aziridine ring opening and other reactions in liquid sulfur dioxide.....	22
Martins Otikovs, Nina Kronqvist, Marlene Andersson, Gefei Chen. Towards spinning of artificial spider silk	23
Helmars Smits. Agrochemical process research: synthesis of aryl 1,3-diones and stereoselective cyclopropanation.....	24

Posters

Laura Adere. Dihydrocinnamic acid esters as antioxidants.....	27
Rūdolfs Beļunieks, Uldis Peipiņš, Andis Melderis. 28-Deoxy-28-aminobetulin and its synthetic application.....	28
Estefaniya Bogdanova. Crystal structures and solid form diversity of several chloronitrobenzoic acid isomers	29
Pavels Dimitrijevs. Contribution of molecular structure to physicochemical properties and cytotoxicity of bifunctional lipid-like 4-(<i>N</i> -alkylpyridinium)-1,4-dihydropyridines	30
Daniela Godiņa. Stability studies of bioactive compounds from birch outer bark ethanolic extracts	31
Lūkass Tomass Lukaševics. Cyclopropane C-C bond cleavage in the Ritter reaction conditions ...	32
Renāte Melngaile. Investigation of intermolecular olefine iodosulfenylation reaction	33
Matīss Pāls. Determination of quaternized ammonium salts in solution after organoclay processing	34
Mikus Puriņš. Synthesis of silyl dienes from propargyl silanes	35
Jekabs Ragze. Derivatization of 1,4-dihydropyridines at 2,6-position and studies of their self-assembling properties	36

L-11

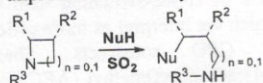
Aziridine Ring Opening and Other Reactions in Liquid Sulfur Dioxide

Jevgenija Lugiņina

Faculty of Materials Science and Applied Chemistry, Riga Technical University,
Paula Valdena Str. 3, Riga, LV-1048, Latvia
jevgenija.luginina@rtu.lv

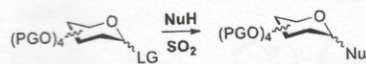
In recent years, many applications of SO₂ and its surrogates in organic synthesis have been reported [1]. Due to high polarity and Lewis acid properties sulfur dioxide can be used as strongly ionizing solvent. Furthermore, it has a high dipole moment (1.61 D), therefore it readily dissolves both organic and inorganic compounds. On the other hand, SO₂ has been reported as a reaction medium for processes involving carbenium ions. Surprisingly, despite all these facts sulfur dioxide has not entered the "classic toolbox" of synthetic organic chemist as an everyday-solvent. This has prompted us to search for organic reactions that would profit from their running in liquid SO₂ as a reaction medium.

We have discovered that different aziridines and azetidines undergo efficient ring-opening reactions in liquid SO₂ with metal halides and thiols as nucleophiles (Scheme 1) [2,3]. Transformations proceed stereoselectively without racemization of chiral center in the case of enantiomerically pure protected or unprotected heterocycles.



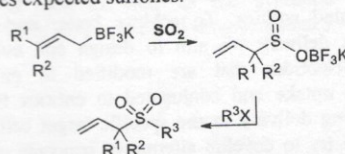
Scheme 1. Nucleophilic ring opening of small heterocycles in liquid SO₂.

We investigated glycosylation reaction with a wide range of *O*-, and *S*-nucleophiles of different monosaccharides in liquid SO₂ (Scheme 2). Employing SO₂ as a reaction media and glycosyl fluorides (LG = F) as glycosyl donors we performed nucleophilic displacement without any additional promoter or Lewis acid additive.



Scheme 2. Formation of glycosyl bond in liquid SO₂.

A novel method for the synthesis of sulfones also has been elaborated. The first step in this sequence is bora-ene reaction of sulfur dioxide and substituted potassium trifluoroborate giving a sulfinate moiety complexed to borate center (Scheme 3). It was observed that crotyl and prenyl systems react at their γ -position with SO₂. This serves as evidence for the *ene*-type regioselectivity. In the second step the alkylation of sulfinate moiety provides expected sulfones.



Scheme 3. Sulfone synthesis using bora-ene reaction as a key step.

Supervisor: Dr. chem. M. Turks

ACKNOWLEDGEMENTS

This work was financed by the Latvian Council of Science (grant number 12.0291). J.L. thanks L'ORÉAL Latvia with the support of the Latvian National Commission for UNESCO and the Latvian Academy of Sciences for 'For Women In Science' scholarship. The authors are indebted to Mr. A. Kinēns for HPLC analysis and Dr. chem. D. Stepanovs for X-ray analysis.

REFERENCES

- [1] Lugiņina, J. *Synlett*, **2014**, 25, 2962.
- [2] Lugiņina, J.; Uzuleņa, J.; Posevins, D.; Turks, M. *Eur. J. Org. Chem.* **2016**, 1760.
- [3] Lugiņina, J.; Turks, M. *Synlett* **2017**, 28, 939.