

# Johan Gadolin Process Chemistry Centre Publications 2014

## 1 Theses

### 1.1 Doctoral theses (16)

Anugwom, Ikenna, Towards optimal fractionation of lignocellulosic biomass using switchable ionic liquids

Dax, Daniel, Chemical derivatization of galactoglucomannan for functional materials

Demidova, Yuliya, Terpenoid transformations over gold catalysts

Fugleberg, Sigmund, Improving the competitiveness of the electrolytic zinc process by chemical reaction engineering approach

Grönqvist, Stina, Action of laccase on mechanical softwood pulps

Hyvärinen, Sari, Ionic liquid mediated biomass deconstruction: from analysis to fermentable sugars

Häärä, Matti, Oxalic acid and calcium oxalate in production of wood-containing paper: formation, analysis, and control

Martin Curvelo, Gerson, Novel technology for preparation of optically active agents

Riittonen, Toni, Bio-ethanol valorization towards C4s including 1-butanol over metal modified alumina and zeolite catalysts

Rozmyslowicz, Bartoz, Deoxygenation of fatty acids for production of fuels and chemicals

Salminen, Eero, Catalytic upgrading of biomass extractives to fine chemicals over supported ionic liquid catalysts (SILICAs)

Schmidt, Sabrina, Methyl and ethyl chloride synthesis in microreactors

Stekrova, Martina,  $\alpha$ -pinene oxide and verbenol oxide isomerizations over heterogeneous catalysts

Suominen, Petteri, Thermal reactions of the major hydrocarbon components of biomass gasification gas

Vainio, Emil, Fate of fuel-bound nitrogen and sulfur in biomass-fired industrial boilers

Vähä-Savo, Niklas, Behavior of black liquor nitrogen in combustion – formation of cyanate

## 1.2 Master´s theses (16)

Behraves, Erfan, Preparation and optimization of alumina foams via replica technique

Bilyavichyus, Roman, Homogeneous and heterogeneous catalytic hydrolysis of inulin from chicory root

Bizzotto, Francesco, Application of the catalyst wet pre-treatment method (CWPM) for catalytic direct synthesis of H<sub>2</sub>O<sub>2</sub>

Freites Aguilera, Adriana Samantha, Epoxidation of fatty acids assisted by microwaves for development of biolubricants

Gonzalez Vogel, Alvaro, Amperometric Sensor for quantification of condensed lignin structures in chemical pulping

Hupa, Elisa, Novel signal transduction principle for ion sensors

Matamala, Verónica, Furfural production from prehydrolysis Kraft liquor of Eucalyptus wood

Mattsson, Ida, Synthesis of a water soluble cellulose derivative by butyl glycidyl etherification of cellulose

Niemi, Jonne, Effect of temperature gradient on synthetic ash deposit chemistry, deposit morphology and superheater corrosion

Nuñez, Tomás, Valorisation of hemicelluloses from *Pinus radiata* sawdust through hot water extraction towards production of valuable chemicals and materials

Raitanen, Jan-Erik, Syntes av imperanenderivat utgående från hydroximatairesinol

Rujana, Luis, Isomerization of  $\alpha$ - and  $\beta$ -pinene oxide over supported ionic liquids catalysts (SILCA)

Shumilov, Vladimir, Manufacture of macroporous ceramic foams to be used as catalytic supports,

Sundqvist, Maria, Rening av aluminiumhaltigt slam

Toivari, Mauno, Mechanical and chemical characterization of BLN pulp

Torozova, Alexandra, Reactions of verbenol oxide for synthesis of fine chemicals over acidic and Fe-modified zeolite catalysts

## 2 Publications

### 2.1 Articles in refereed international scientific journals and series (125)

1. Abdulmajeed, A.A., Walboomers, X.F., Massera, J., Kokkari, A.K., Vallittu, P.K., Närhi, T.O., **Blood and fibroblast responses to thermoset BisGMA-TEGDMA/glass fiber-reinforced composite implants in vitro**, *Clinical Oral Implants Research* 25 (2014) 7, 843-851
2. Abdulmajeed, A.A., Kokkari, A.K., Käpylä, J., Massera, J., Hupa, L., Vallittu, P.K., Närhi, T.O., **In vitro blood and fibroblast responses to BisGMA-TEGDMA/bioactive glass composite implants**, *Journal of Materials Science: Materials in Medicine* 25 (2014) 1, 151-162
3. Anugwom, I., Eta, V., Virtanen, P., Mäki-Arvela, P., Hedenström, M., Yibo, M., Hummel, M., Sixta, H., Mikkola, J-P., **Towards optimal selective fractionation for Nordic woody biomass using novel amine-organic superbases derived switchable ionic liquids (SILs)**, *Biomass and Bioenergy* 70 (2014), 373-381
4. Anugwom, I., Eta, V., Mäki-Arvela, P., Virtanen, P., Lahtinen, M., Mikkola, J-P., **The effect of switchable ionic liquid (SIL) treatment on the composition and crystallinity of birch chips (*Betula pendula*) using a novel alkanol amine-organic superbase-derived SIL**, *Green Processing and Synthesis* 3 (2014) 2, 147-154
5. Anugwom, I., Eta, V., Mäki-Arvela, P., Virtanen, P., Hedenström, M., Hummel, M., Sixta, H., Mikkola, J-P., **Switchable ionic liquids as delignification solvents for lignocellulosic materials**, *ChemSusChem* 7 (2014) 4, 1170-1176
6. de Araujo Filho, C., Eränen, K., Mikkola, J-P., Salmi, T., **A comprehensive study on the kinetics, mass transfer and reaction engineering aspects of solvent-free glycerol hydrochlorination**, *Chemical Engineering Science* 120 (2014), 88-104
7. Arve, K., Mäki-Arvela, P., Eränen, K., Salmi, T., Murzin, D.Yu., **Utilisation of a multitubular reactor system for parallel screening of catalysts for ring opening of decalin in continuous mode**, *Chemical Engineering Journal* 238 (2014), 3-8
8. Baeza, J.A., Calvo, L., Murzin, D.Yu., Rodriguez, J.J., Gillaranz, M.A., **Kinetic analysis of 4-chlorophenol hydrodechlorination by Rh nanoparticles based on the two-step reaction and Langmuir-Hinshelwood mechanisms**, *Catalysis Letters* 144 (2014) 12, 2080-2085
9. Banerjee, P., Pranovich, A., Dax, D., Willför, S., **Non-cellulosic heteropolysaccharides from sugarcane bagasse - Sequential extraction with pressurized hot water and alkaline peroxide at different temperatures**, *Bioresource Technology* 155 (2014), 446-450

10. Biasiotto, G., Penza, M., Zanella, I., Cadei, M., Caimi, L., Rossini, C., Smeds, A., Di Lorenzo, D., **Oilseeds ameliorate metabolic parameters in male mice, while contained lignans inhibit 3T3-L1 adipocyte differentiation in vitro**, *European Journal of Nutrition* 53 (2014), 1685-1697
11. Bernas, H., Kumar, N., Aho, A., Leino, R., Murzin, D.Y., **Hydrogenation of 2-methylindole using supported metal catalysts**, *Catalysis Communications* 56 (2014), 41-44
12. Binti Saleh, S., Flensburg, J.P., Khazraie Shoulaifar, T., Sárossy, Z., Hansen, B.B., Egsgaard, H., DeMartini, N., Jensen, P.A., Glarborg, P., Dam-Johansen, K., **Release of chlorine and sulfur during biomass torrefaction and pyrolysis**, *Energy and Fuels* 28 (2014) 6, 3738-3746
13. Bittante, A., Garcia-Serna, J., Biasi, P., Sobron, F., Salmi, T., **Residence time and axial dispersion of liquids in trickle bed reactors at laboratory scale**, *Chemical Engineering Journal* 250 (2014), 99-111
14. Bober, P., Liu, J., Mikkonen, K., Ihalainen, P., Pesonen, M., Plumed-Ferrer, C., von Wright, A., Lindfors, T., Xu, C., Latonen, R-M., **Biocomposites of nanofibrillated cellulose, polypyrrole, and silver nanoparticles with electroconductive and antimicrobial properties**, *Biomacromolecules* 15 (2014) 10, 3655-3663
15. Boeva, Z., Milakin, K., Pesonen, M., Ozerin, A., Sergeyev, V., Lindfors, T., **Dispersible composites of exfoliated graphite and polyaniline with improved electrochemical behaviour for solid-state chemical sensor applications**, *RSC Advances* 4 (2014) 86, 46340-46350
16. Bourhis, K., Shpotyuk, Y., Massera, J., Aallos, V., Jouan, T., Boussard-Plédel, C., Bureau, B., Petit, L., Koponen, J., Hupa, L., Hupa, M., Ferraris, M., **Thermal and structural characterization of erbium-doped borosilicate fibers with low silica content containing various amounts of P<sub>2</sub>O<sub>5</sub> and Al<sub>2</sub>O<sub>3</sub>**, *Optical Materials* 37 (2014), 87-92
17. Chuparev, E.V., Zernov, P.A., Paruts, O.I., Murzin, D.Yu., **Process of n-pentane isomerization in a combined column of reaction-rectification type**, *Bulletin of St. Petersburg State Technological Institute* 23 (2014), 43-47
18. Conde, E., Fang, W., Hemming, J., Willför, S., Domínguez, H., Parajó, J.C., **Recovery of bioactive compounds from *Pinus pinaster* wood by consecutive extraction stages**, *Wood Science and Technology* 48 (2014) 2, 311-323
19. Cui, J., Lisak, G., Strzalkowska, S., Bobacka, J., **Potentiometric sensing utilizing paper-based microfluidic sampling**, *Analyst* 139 (2014) 9, 2133-2136
20. Dax, D., Soledad Chávez Bastidas, M., Xu, C., Willför, S., Mendonça, R.T., Poblete, J.A.S., **Cationic hemicellulose-based hydrogels for arsenic and chromium removal from aqueous solutions**, *Carbohydrate Polymers* 111 (2014), 797-805

21. Demidova, Yu.S., Simakova, I.L., Wärnå, J., Simakov, A., Murzin, D.Yu., **Kinetic modeling of one-pot myrtenol amination over Au/ZrO<sub>2</sub>**, *Chemical Engineering Journal* 238 (2014), 164-171
22. Demidova, Yu.S., Ardashov, O.V., Simakova, O.A., Simakova, I.L., Volcho, K.P., Salakhutdinov, N.F., Murzin, D.Yu., **Isomerization of bicyclic terpene epoxides into allylic alcohols without changing of the initial structure**, *Journal of Molecular Catalysis A. Chemical* 388-389 (2014), 162-166
23. Dumitriu, C., Stoian, A., Titorencu, I., Pruna, V., Jinga, V., Latonen, R-M., Bobacka, J., Demetrescu, I., **Electrospun TiO<sub>2</sub> nanofibers decorated Ti substrate for biomedical application**, *Materials Science and Engineering: C* 45 (2014), 56-63
24. Durante, D., Kilpiö, T., Suominen, P., Herrera, V., Wärnå, J., Canu, P., Salmi, T., **Modelling and simulation of a small-scale trickle bed reactor for sugar hydrogenation**, *Computers & Chemical Engineering* 66 (2014), 22-35
25. Eta, V., Anugwom, I., Virtanen, P., Eränen, K., Mäki-Arvela, P., Mikkola, J-P., **Loop vs. batch reactor setups in the fractionation of birch chips using switchable ionic liquids**, *Chemical Engineering Journal* 238 (2014), 242-248
26. Eta, V., Anugwom, I., Virtanen, P., Mäki-Arvela, P., Mikkola, J-P., **Enhanced mass transfer upon switchable ionic liquid mediated wood fractionation**, *Industrial Crops & Products* 55 (2014), 109-115
27. Faba, L., Kusema, B.T., Murzina, E.V., Tokarev, A., Kumar, N., Smeds, A., Díaz, E., Ordóñez, S., Mäki-Arvela, P., Willför, S., Salmi, T., Murzin, D.Yu., **Hemicellulose hydrolysis and hydrolytic hydrogenation over proton- and metal modified beta zeolites**, *Microporous and Mesoporous Materials* 189 (2014), 189-199
28. Gabov, K., Gosselink, R., Smeds, A.I., Fardim, P., **Characterization of lignin extracted from birch wood by a modified hydrotropic process**, *Journal of Agricultural and Food Chemistry* 62 (2014) 44, 10759-10767
29. Garcia-Serna, J., Moreno, T., Biasi, P., Cocero, M.J., Mikkola, J-P., Salmi, T., **Engineering in direct synthesis of hydrogen peroxide: targets, reactors and guidelines for operational conditions**, *Green Chemistry* 16 (2014) 5, 2320-2343
30. Granholm, K., Mousavi, Z., Sokalski, T., Lewenstam, A., **Analytical quality solid-state composite reference electrode manufactured by injection moulding**, *Journal of Solid State Electrochemistry* 18 (2014) 3, 607-612
31. Houshfar, E., Wang, L., Vähä-Savo, N., Brink, A., Lovås, T., **Characterisation of CO/NO/SO<sub>2</sub> emission and ash-forming elements from the combustion and pyrolysis process**, *Clean Technologies and Environmental Policy* 16 (2014) 7, 1339-1351

32. Hyvärinen, S., Mikkola, J-P., Murzin, D.Yu., Vaher, M., Kaljurand, M., Koel, M., **Sugars and sugar derivatives in ionic liquid media obtained from lignocellulosic biomass: comparison of capillary electrophoresis and chromatographic analysis**, *Catalysis Today* 223 (2014), 18-24
33. Häärä, M., Vähäsalo, L., Lundin, T., Fang, W., Sundberg, A., Willför, S., **Calcium oxalate precipitation in the presence of magnesium, wood resin and galactoglucomannans**, *Journal of Science Technology for Forest Products and Processes J-FOR* 3 (2013) 4, 19-29
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35. Häärä, M., Pranovich, A., Sundberg, A., Willför, S., **Formation of oxalic acid in alkaline peroxide treatment of different wood substances**, *Holzforschung* 68 (2014) 4, 393-400
36. Jogunola, O., Salmi, T., Mikkola, J-P., **Screening of potential complexing agents in methyl formate hydrolysis**, *Journal of Molecular Liquids* 196 (2014), 334-339
37. Järvinen, T., Agar, D., **Experimentally determined storage and handling properties of fuel pellets made from torrefied whole-tree pine chips, logging residues and beech stem wood**, *Fuel* 129 (2014), 330-339
38. Kangas, P., Koukkari, P., Hupa, M., **Modeling biomass conversion during char gasification, pyrolysis, and torrefaction by applying constrained local thermodynamic equilibrium**, *Energy and Fuels* 28 (2014) 10, 6361-6370
39. Kangas, P., Hannula, I., Koukkari, P., Hupa, M., **Modelling super-equilibrium in biomass gasification with the constrained Gibbs energy method**, *Fuel* 129 (2014), 86-94
40. Karaman, D.S., Gulin-Sarfraz, T., Hedström, G., Duchanoy, A., Eklund, P., Rosenholm, J.M., **Rational evaluation of the utilization of PEG-PEI copolymers for the facilitation of silica nanoparticulate systems in biomedical applications**, *Journal of colloid and interface science* 418 (2014), 300-310
41. Karlsson, D., Fallarero, A., Shinde, P., Anju, C.P., Busygin, I., Leino, R., Mohan, C.G., Vuorela, P., **Chemical modifications of cinchona alkaloids lead to enhanced inhibition of human butyrylcholinesterase**, *Natural Product Communications* 9 (2014), 455-458
42. Kilpeläinen, P.O., Hautala, S.S., Byman, O.O., Tanner, L.J., Korpinen, R.I., Lillandt, M.K-J., Pranovich, A.V., Kitunen, V.H., Willför, S.M., Ilvesniemi, H.S., **Pressurized hot water flow-through extraction system scale up from laboratory to pilot scale**, *Green Chemistry* 16 (2014) 6, 3186-3194

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44. Kirilin, A.V., Hasse, B., Tokarev, A.V., Kustov, L.M., Baeva, G.N., Bragina, G.O., Stakheev, A.Yu., Rautio, A-R., Salmi, T., Etzold, B.J.M., Mikkola, J-P., Murzin, D.Yu., **Aqueous phase reforming of xylitol over Pt/C and Pt-CDC catalysts: catalyst characterization and catalytic performance**, *Catalysis Science and Technology* 4 (2014), 387-401
45. Kirilin, A.V., Wärnå, J., Tokarev, A.V., Murzin, D.Yu., **Kinetic modelling of sorbitol aqueous phase reforming over Pt/Al<sub>2</sub>O<sub>3</sub>**, *Industrial and Engineering Chemistry Research* 53 (2014), 4580-4588
46. Kirilin, A.V., Tokarev, A.V., Manyar, H., Hardacre, C., Salmi, T., Mikkola, J-P., Murzin, D.Yu., **Aqueous phase reforming of xylitol over Pt-Re bimetallic catalysts**, *Catalysis Today* 223 (2014), 97-107
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49. Konwar, J.L., Das, R., Thakur, A.J., Salminen, E., Mäki-Arvela P., Kumar, N., Mikkola, J-P., Deka, D., **Biodiesel production from acid oils using sulfonated carbon catalyst derived from oil-cake waste**, *Journal of Molecular Catalysis A: Chemical* 288 (2014), 167-176
50. Korpinen, R., Kallioinen, M., Hemming, J., Pranovich, A., Mänttari, M., Willför, S., **Comparative evaluation of various lignin determination methods on hemicellulose-rich fractions of spruce and birch obtained by pressurized hot-water extraction (PHWE) and subsequent ultrafiltration (UF)**, *Holzforschung* 68 (2014) 8, 971-979
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52. Lane, D.J., Zevenhoven, M., Ashman, P.J., van Eyk, P.J., Hupa, M., de Nys, R., Lewis, D.M., **Algal biomass: occurrence of the main inorganic elements and simulation of ash Interactions with bed material**, *Energy and Fuels* 28 (2014) 7, 4622-4632

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54. Le Normand, M., Mélida, H., Holmbom, B., Michaelsen, T.E., Inngjerdigen, M., Bulone, V., Smestad Paulsen, B., Ek, M., **Hot-water extracts from the inner bark of Norway spruce with immunomodulating activities**, *Carbohydrate Polymers* 101 (2014), 699-704
55. Leppänen, A-S., Xu, C., Parikka, K., Eklund, P., Sjöholm, R., Brumer, H., Tenkanen, M., Willför, S., **Targeted allylation and propargylation of galactose-containing polysaccharides in water**, *Carbohydrate Polymers* 100 (2014) 1, 46-54
56. Leveneur, S., Zheng, J., Taouk, B., Burel, F., Wärnå, J., Salmi, T., **Interaction of thermal and kinetic parameters for a liquid-liquid reaction system: Application to vegetable oils epoxidation by peroxydicarboxylic acid**, *Journal of the Taiwan Institute of Chemical Engineers* 45 (2014) 4, 1449-1458
57. Leveneur, S., Ledoux, A., Estel, L., Taouk, B., Salmi, T., **Epoxidation of vegetable oils under microwave irradiation**, *Chemical Engineering Research and Design* 92 (2014) 8, 1495-1502
58. Li, H., DeMartini, N., Chai, X.S., **Formation of soluble calcium in alkaline pulping of acacia**, *Industrial and Engineering Chemistry Research* 53 (2014) 44, 17282–17285
59. Lill, J-O., Himberg, M., Harju, L., Ek, P., Lindroos, A., Wiklund, T., Gunnelius, K., Smått, J-H., Heselius, S-J., Hägerstrand, H., **Strontium and zinc concentrations in otoliths of common fish species in the northern Baltic Sea**, *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms* 318 (2014) A, 109-112
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61. Lindfors, T., Latonen, R-M., **Improved charging/discharging behavior of electropolymerized nanostructured composite films of polyaniline and electrochemically reduced graphene oxide**, *Carbon* 69 (2014), 122-131
62. Lindqvist, H., Bialczak, S., Willför, S., Sundberg, A., **Functionalization of paper surfaces by modified galactoglucomannans in paper**, *Journal of Science Technology for Forest Products and Processes (J-FOR)* 3 (2014) 4, 6-12
63. Lisak, G., Ivaska, A., Lewenstam, A., Bobacka, J., **Multicalibrational procedure for more reliable analyses of ions at low analyte concentrations**, *Electrochimica Acta* 140 (Special issue) (2014), 27-32



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66. Martin, G., Mäki-Arvela, P., Murzin, D.Yu., Salmi, T., **Kinetics and catalyst deactivation in the enantioselective hydrogenation of ethyl benzoylformate over Pt/Al<sub>2</sub>O<sub>3</sub>**, *Catalysis Science & Technology* 4 (2014) 1, 170-178
67. Martin, G., Mäki-Arvela, P., Wärnä, J., Honkala, K., Murzin, D.Yu., Salmi, T., **Kinetic modelling of benzoylformate enantioselective hydrogenation over Pt/Al<sub>2</sub>O<sub>3</sub>**, *Industrial and Engineering Chemistry Research* 53 (2014), 11945–11953
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69. Massera, J.M., Vassallo-Breillot, M., Törngren, B., Glorieux, B., Hupa, L., **Effect of CeO<sub>2</sub> doping on thermal, optical, structural and in vitro properties of a phosphate based bioactive glass**, *Journal of Non-Crystalline Solids* 402 (2014), 28–35
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74. Meana-Esteban, B., Petr, A., Kvarnström, C., Ivaska, A., Dunsch, L., **Poly(2-methoxynaphthalene): A spectroelectrochemical study on a fused ring conducting polymer**, *Electrochimica Acta* 115 (2014), 10-15
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78. Murzin, D.Yu., **Evolution of heterogeneous catalytic reactions kinetics with time**, *Comptes Rendus Chimie* 17 (2014), 612-614
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#### **4 General articles (1)**

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#### **5 Patents and invention disclosures (5)**

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#### **6 Awards granted (6)**

Bergelin, Mikael, 1<sup>st</sup> prize in "Best Business Path Competition", awarded by Turku Science Park

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Kilpiö, Teuvo, Best doctoral thesis in the field of chemical engineering, awarded by The Finnish Society of Chemical Engineers

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