Research Highlights

Highlights from the Flow Chemistry Literature 2011 (Part 3)

Toma N. Glasnov*

Institute of Chemistry, Karl-Franzens-University Graz, Heinrichstrasse 28, A-8010 Graz, Austria

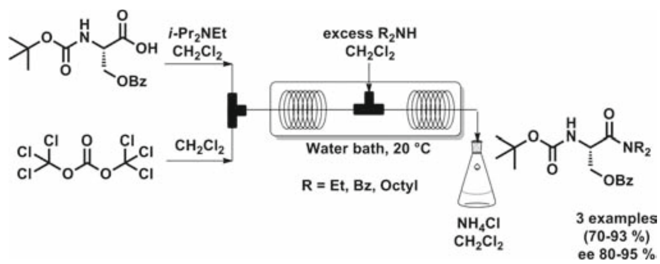
In this section of the journal, the continuous flow chemistry literature of the preceding months is presented. The first part for the year 2012 includes articles published in the last 3 months of 2011. Some key examples are highlighted in the form of graphical abstracts. The remaining publications in the field are then listed grouped by journal name, with review articles grouped at the end.

13/2011

Continuous *in situ* Generation and Reaction of Phosgene in a Microflow System
Shichiro Fuse, Nobutake Tanabe, Takashi Takahashi*

Chem. Commun. **2011**, *47*, 12661–12663 *DOI: 10.1039/c1cc15662d*

In situ generation of phosgene and its immediate use for acid chloride formation are described. Triphosgene is used as source for the generation of phosgene. The formed acid chlorides are reacted with an excess of a nucleophile (amines) to form amides and also quench the excess of phosgene. A final reaction quench is assured by the use of an NH_4Cl solution in the receiving vial. This method also gave somewhat superior *ee* distributions as compared to a batch synthesis. The continuous-flow system was assembled from inexpensive laboratory parts – syringes, pumps, and stainless steel T-shape mixers.

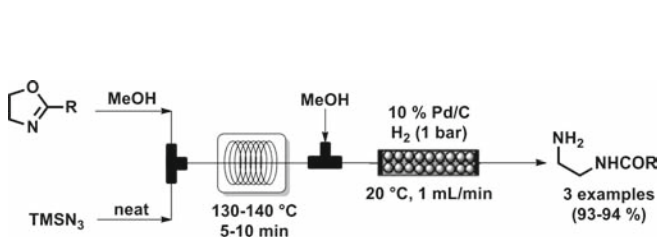


14/2011

A Two Step Continuous-Flow Synthesis of *N*-(2-Aminoethyl)acylamides through Ring-Opening/Hydrogenation of Oxazolines
Bernhard Gutmann, Jean-Paul Roduit, Dominique Roberge,* C. Oliver Kappe*

Chem. Eur. J. **2011**, *17*, 13146–13150 *DOI: 10.1002/chem.201102772*

Ring opening of 2-oxazolines to generate compounds containing the *N*-(2-aminoethyl)acylamide scaffold is described. Neat $TMSN_3$ was used as a nuclepohile in this reaction, followed by hydrogen reduction of the formed azide to the final products. After some initial optimization of the two reactions separately, a final protocol was developed, where an uninterrupted continuous-flow process was achieved. Importantly, the uninterrupted flow process provides additional safety, since the excess/unreacted HN_3 (toxic, explosive) formed in the ring-opening step is efficiently destroyed in the following hydrogenation step without disturbing the synthetic process.



* Author for correspondence: toma.glasnov@uni-graz.at

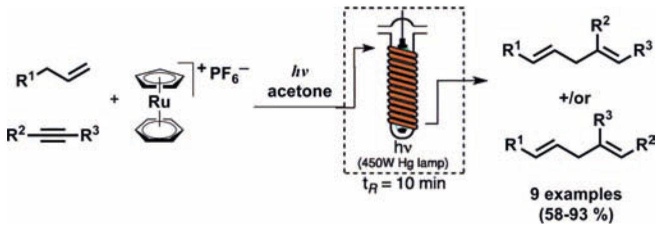
DOI: 10.1556/jfchem.2012.0001

15/2011

Continuous Photochemical Generation of Catalytically Active [CpRu]+ Complexes from CpRu(η^6-C_6H_6)PF_6
Alicia C. Gutierrez, Timothy F. Jamison*

Org. Lett. **2011**, *13*, 6414–6417 *DOI: 10.1021/ol2027015*

Using CpRu(η^6-C_6H_6)PF_6 as a catalyst precursor, inter- and intramolecular ene–yne coupling reactions under continuous-flow UV-light conditions are reported. With some exceptions, most of the demonstrated examples gave similar results under batch and continuous-flow conditions. The used Ru-complex could be recovered nearly quantitatively and reused without any loss of activity. As UV-permeable tubing, either quartz or HPFA tube was used, both allowing the reaction to reach full conversion. The effect of residence time and catalyst loading on the outcome of the reaction was also examined.

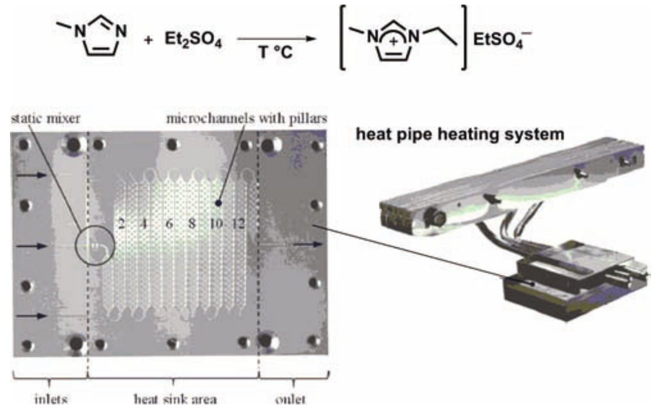


16/2011

Heat Pipe-Mediated Control of Fast and Highly Exothermal Reactions
Nadine Ehm, Holger Löwe*

Org. Process Res. Dev. **2011**, *15*, 1438–1441 *DOI: 10.1021/op200216y*

The synthesis of [EMIM]$EtSO_4$ as a highly exothermal process was used to examine a heating/cooling concept based on heat pipes, normally used to dissipate heat from computer processors. Once the activation barrier in the latter reaction is reached, the generated heat excess has to be kept under precise control in order to avoid hot spots or thermal runaways. Therefore, a complex thermal balance between providing activation energy and intense cooling of the reaction mixture is required. Heat pipes intrinsically allow both fast dynamic bidirectional heating and cooling. A stainless steel chip setup was mounted on the modified heat pipe setup. Working in a flow regime in the area of 100 °C, clean product could be obtained.

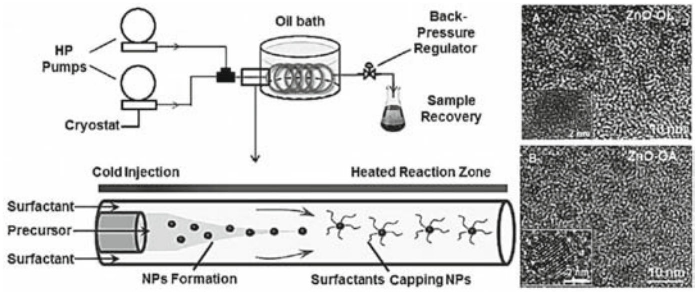


17/2011

Synthesis of Exciton Luminescent ZnO Nanocrystals Using Continuous Supercritical Microfluidics
Yann Roig, Samuel Marre, Thierry Cardinal, Cyril Aymonier*

Angew. Chem. Int. Ed. **2011**, *50*, 12071–12074 *DOI: 10.1002/anie.201106201*

An interesting microfluidic concept to synthesize exciton luminescent ZnO nanocrystals at supercritical conditions is demonstrated. The advanced optical properties of the as-synthesized ZnO nanostructures are obtained as a function of their nucleation and growth in supercritical fluids and the separation of nucleation/growth and functionalization steps, both being performed in a hydrodynamically controlled environment in the microreactors. Several operating parameters have been investigated: (1) the ligand (oleylamine, trioctylphosphine and oleic acid), (2) the ligand-to-zinc molar ratio, (3) the oxidant-to-zinc molar ratio and (4) the fluid velocity ratio. The experiments were carried out in a coaxial microsystem made of two fused silica capillaries immersed in a pre-heated oil bath (250 °C). The pressure was controlled with a back pressure regulator.



Further Flow Chemistry Publications

"Conversion of glycerol to acrolein in the presence of WO_3/TiO_2 catalysts"
A. Ulgen, W. F. Hoelderich
Applied Catalysis A: General **2011**, *400*, 34–38

"Methanol dehydration to dimethyl ether in a platelet milli-reactor filled with H-ZSM5/SiC foam catalyst"
Y. Liu, S. Podila, D. L. Nguyen, D. Edouard, P. Nguyen, C. Pham, M. J. Ledoux, C. Pham-Huu
Applied Catalysis A: General **2011**, *409–410*, 113–121

"Transesterification of sunflower oil over MoO_3 supported on alumina"
T. M. Sankaranarayanan, A. Pandurangan, M. Banu, S. Sivasanker
Applied Catalysis A: General **2011**, *409–410*, 239–247

"Continuous syntheses of highly dispersed composite nanocatalysts via simultaneous co-precipitation in supercritical water"
X. Weng, J. Zhang, Z. Wu, Y. Liu, H. Wang, J. A. Darr
Applied Catalysis B: Environmental **2011**, *103*, 453–461

"Continuous-flow synthesis of biaryls enabled by multistep solid-handling in a lithiation/borylation/Suzuki–Miyaura cross-coupling sequence"
W. Shu, L. Pellegatti, M. A. Oberli, S. L. Buchwald
Angewandte Chemie International Edition **2011**, *50*, 10665–10669

"Mechanism-performance relationships of metal oxides in catalyzed HCl oxidation"
A. P. Amrute, C. Mondelli, M. A. G. Hevia, J. Perez-Ramírez
ACS Catalysis **2011**, *1*, 583–590

"Carbon nanotube-supported RuFe bimetallic nanoparticles as efficient and robust catalysts for aqueous-phase selective hydrogenolysis of glycerol to glycols"
B. Li, J. Wang, Y. Yuan, H. Ariga, S. Takakusagi, K. Asakura
ACS Catalysis **2011**, *1*, 1521–1528

"Zeolite- and MgO-supported molecular iridium complexes: support and ligand effects in catalysis of ethene hydrogenation and H-D exchange in the conversion of $H_2 + D_2$"
J. Lu, P. Serna, B. C. Gates
ACS Catalysis **2011**, *1*, 1549–1561

"Production of propylene from 1-butene on highly active "Bi-functional single active site" catalyst: tungsten carbene-hydride supported on alumina"
E. Mazoyer, K. C. Szeto, S. Norsic, A. Garron, J.-M. Basset, C. P. Nicholas, M. Taoufik
ACS Catalysis **2011**, *1*, 1643–1646

"Novel sol-gel lipases by designed bio-imprinting for continuous-flow kinetic resolutions"
G. Hellner, Z. Boros, A. Tomin, L. Poppe
Advanced Synthesis & Catalysis **2011**, *353*, 2481–2491

"Ethene-induced temporary inhibition of Grubbs metathesis catalysts"
J. Scholz, S. Loekman, N. Szesni, W. Hieringer, A. Görling, M. Haumann, P. Wasserscheid
Advanced Synthesis & Catalysis **2011**, *353*, 2701–2707

"Translation of microwave methodology to continuous flow for the efficient synthesis of diaryl ethers via a base-mediated S_NAr reaction"
C. Wiles, P. Watts
Beilstein Journal of Organic Chemistry **2011**, *7*, 1360–1371

"Continuous preparation of carbon-nanotube-supported platinum catalysts in a flow reactor directly heated by electric current"
A. Schlange, A. R. dos Santos, U. Kunz, T. Turek
Beilstein Journal of Organic Chemistry **2011**, *7*, 1412–1420

"Multistep flow synthesis of vinyl azides and their use in the copper-catalyzed Huisgen-type cycloaddition under inductive-heating conditions"
L. Kupracz, J. Hartwig, J. Wegner, S. Ceylan, A. Kirschning
Beilstein Journal of Organic Chemistry **2011**, *7*, 1441–1448

"Continuous-flow enantioselective α-aminoxylation of aldehydes catalyzed by a polystyrene-immobilized hydroxyproline"
X. C. Cambeiro, R. Martín-Rapún, P. O. Miranda, S. Sayalero, E. Alza, P. Llanes, M. A. Pericàs
Beilstein Journal of Organic Chemistry **2011**, *7*, 1486–1493

"The application of a monolithic triphenylphosphine reagent for conducting Appel reactions in flow microreactors"
K. A. Roper, H. Lange, A. Polyzos, M. B. Berry, I. R. Baxendale, S. V. Ley
Beilstein Journal of Organic Chemistry **2011**, *7*, 1648–1655

"Continuous proline catalysis via leaching of solid proline"
S. M. Opalka, A. R. Longstreet, D. T. McQuade
Beilstein Journal of Organic Chemistry **2011**, *7*, 1671–1679

"Continuous-flow hydration–condensation reaction: Synthesis of α,β-unsaturated ketones from alkynes and aldehydes by using a heterogeneous solid acid catalyst"
M. Rueping, T. Bootwicha, H. Baars, E. Sugiono
Beilstein Journal of Organic Chemistry **2011**, *7*, 1680–1687

“Liquid-phase catalytic transfer hydrogenation and cyclization of levulinic acid and its esters to γ-valerolactone over metal oxide catalysts”
M. Chia, J. A. Dumesic
Chemical Communications **2011**, *47*, 12233–12235

“Highly monodisperse conjugated polymer particles synthesized with drop-based microfluidics”
A. J. C. Kuehne, D. A. Weitz
Chemical Communications **2011**, *47*, 12379–12381

“In situ generation and intramolecular Schmidt reaction of keto azides in a microwave-assisted flow format”
T. O. Painter, P. D. Thornton, M. Orestano, C. Santini, M. G. Organ, J. Aube
Chemistry – A European Journal **2011**, *17*, 9595–9598

“New insights into cyclobutenone rearrangements: A total synthesis of the natural ROS-generating anti-cancer agent Cribrostatin 6”
M. Mohamed, T. P. Goncalves, R. J. Whitby, H. F. Sneddon, D. C. Harrowven
Chemistry – A European Journal **2011**, *17*, 13698–13705

“Continuous flow system with a polymer-supported dirhodium(II) catalyst: Application to enantioselective carbonyl ylide cycloaddition reactions”
Chemistry – A European Journal **2011**, *17*, 13992–13998

“Chemical synthesis of Helicobacter pylori lipopolysaccharide partial structures and their selective proinflammatory responses”
A. Shimoyama, A. Saeki, N. Tanimura, H. Tsutsui, K. Miyake, Y. Suda, Y. Fujimoto, K. Fukase
Chemistry – A European Journal **2011**, *17*, 14464–14474

“A single step methane conversion into synthetic fuels using microplasma reactor”
T. Nozaki, A. Agiral, S. Yuzawa, J. G. E. Han Gardeniers, K. Okazakia
Chemical Engineering Journal **2011**, *166*, 288–293

“Suspension catalysis in a liquid-liquid capillary microreactor”
A. Ufer, D. Sudhoff, A. Mescher, D. W. Agar
Chemical Engineering Journal **2011**, *167*, 468–474

“Enhanced production of ethyl pyruvate using gas-liquid slug flow in microchannel”
T. Yasukawa, W. Ninomiya, K. Ooyachi, N. Aoki, K. Mae
Chemical Engineering Journal **2011**, *167*, 527–530

“Novel Process Window for the safe and continuous synthesis of *tert*-butyl peroxy pivalate in a micro-reactor”
T. Illg, V. Hessel, P. Löb, J. C. Schouten
Chemical Engineering Journal **2011**, *167*, 504–509

“Fischer-Tropsch synthesis in microchannels”
L. C. Almeida, F. J. Echave, O. Sanza, M. A. Centeno, G. Arzamendi, L. M. Gandía, E. F. Sousa-Aguiar, J. A. Odriozola, M. Montes
Chemical Engineering Journal **2011**, *167*, 536–544

“Hydrothermal micro continuous-flow synthesis of spherical, cylinder-, star- and flower-like ZnO microparticles”
S. Li, G. A. Gross, P. M. Günther, J. M. Köhler
Chemical Engineering Journal **2011**, *167*, 681–687

“Microfluidic synthesis of silica nanoparticles using polyethylenimine polymers”
P. He, G. Greenway, S. J. Haswell
Chemical Engineering Journal **2011**, *167*, 694–699

“Production of unstable percarboxylic acids in a microstructured reactor”
F. Ebrahimi, E. Kolehmainen, P. Oinas, V. Hietapelto, I. Turunen
Chemical Engineering Journal **2011**, *167*, 713–717

“Reaction and Raman spectroscopic studies of alcohol oxidation on gold-palladium catalysts in microstructured reactors”
E. Cao, M. Sankar, S. Firth, K. F. Lam, D. Bethell, D. K. Knight, G. J. Hutchings, P. F. McMillan, A. Gavriilidis
Chemical Engineering Journal **2011**, *167*, 734–743

“Bridging the gap: A nested-pipe reactor for slow reactions in continuous flow chemical synthesis”
C. B. Minnich, L. Greinera, C. Reimers, M. Uerdingen, M. A. Liauwa
Chemical Engineering Journal **2011**, *168*, 759–764

“Design and experiments of a short-mixing-length baffled microreactor and its application to microfluidic synthesis of nanoparticles”
C. K. Chung, T. R. Shih, C. K. Chang, C. W. Lai, B. H. Wu
Chemical Engineering Journal **2011**, *168*, 790–798

“Synthesis of gold nanoparticles in an interdigital micromixer using ascorbic acid and sodium borohydride as reducers”
M. Luty-Błocho, K. Fitzner, V. Hessel, P. Löb, M. Maskos, D. Metzke, K. Pacławski, M. Wojnicki
Chemical Engineering Journal **2011**, *171*, 279–290

“Comparative study of the synthesis of silica nanoparticles in micromixer-microreactor and batch reactor systems”
L. Gutierrez, L. Gomez, S. Irusta, M. Arruebo, J. Santamaria
Chemical Engineering Journal **2011**, *171*, 674–683

"Development of a gas-liquid microstructured system for oxidation of hydrogenated 2-ethyltetrahydroanthraquinone"
J. Tan, L. Du, Y. C. Lu, J. H. Xu, G. S. Luo
Chemical Engineering Journal **2011**, *171*, 1406–1414

"Paramagnetic ionic liquids as "liquid fixed-bed" catalysts in flow application"
V. Misuk, D. Breuch, H. Löwe
Chemical Engineering Journal **2011**, *173*, 536–540

"Effect of gas and liquid flow rates on the size distribution of barium sulfate nanoparticles precipitated in a two phase flow capillary microreactor"
D. Jeevarathinam, A. K. Gupta, B. Pitchumani, R. Mohan
Chemical Engineering Journal **2011**, *173*, 607–611

"Flash synthesis of carbohydrate derivatives in chaotic microreactors"
Y.-T. Chen, K.-H. Chen, W.-F. Fang, S.-H. Tsai, J.-M. Fang, J.-T. Yang
Chemical Engineering Journal **2011**, *174*, 421–424

"Heterogeneously catalyzed synthesis of performic acid in a microstructured reactor"
F. Ebrahimi, E. Kolehmainen, I. Turunen
Chemical Engineering Journal **2011**, *179*, 312–317

"Multiphase minireactor system for direct fluorination of ethylene carbonate"
P. Lang, M. Hill, I. Krossing, P. Woias
Chemical Engineering Journal **2011**, *179*, 330–337

"Scale-up concept for modular microstructured reactors based on mixing, heat transfer, and reactor safety"
N. Kockmann, D. M. Roberge
Chemical Engineering and Processing: Process Intensification **2011**, *50*, 1017–1026

"Single-phase fluid flow distribution and heat transfer in microstructured reactors"
E. V. Rebrov, J. C. Schouten, M. H. J. M. de Croon
Chemical Engineering Science **2011**, *66*, 1374–1393

"Two-phase microfluidic flows"
C.-X. Zhao, A. P. J. Middelberg
Chemical Engineering Science **2011**, *66*, 1394–1411

"Nanoparticle synthesis in microreactors"
C.-X. Zhao, L. He, S. Z. Qiao, A. P. J. Middelberg
Chemical Engineering Science **2011**, *66*, 1463–1479

"Gas–liquid and liquid–liquid mass transfer in microstructured reactors"
M. N. Kashid, A. Renken, L. Kiwi-Minsker
Chemical Engineering Science **2011**, *66*, 3876–3897

"Direct conversion of methane in formaldehyde at very short residence time"
J. Zhang,V. Burkle-Vitzthum, P. M. Marquaire, G. Wild, J. M. Commenge
Chemical Engineering Science **2011**, *66*, 6331–6340

"Rate Acceleration of the Baylis–Hillman Reaction within Microreactors"
J. Yang, L. Qi, J. Qiao, Y. Chen, H. Ma
Chinese Journal of Chemistry **2011**, *29*, 2385–2388

"The first case of competitive heterogeneously catalyzed hydrogenation using continuous-flow fixed-bed reactor system: hydrogenation of binary mixtures of activated ketones on Pt-alumina and on Pt-alumina-cinchonidine catalysts"
G. Szőllősi, Z. Makra, F. Fülöp, M. Bartók
Catalysis Letters **2011**, *141*, 1616–1620

"Intramolecular cyclisation of isosorbide by dimethylcarbonate chemistry"
P. Tundo, F. Arico, G. Gauthier, A. Baldacci
Compets Rendus Chimie **2011**, *14*, 652–655

"Immobilised photosensitisers for continuous flow reactions of singlet oxygen in supercritical carbon dioxide"
X. Han, R. A. Bourne, M. Poliakoff, M. W. George
Chemical Science **2011**, *2*, 1059–1067

"Use of precatalysts greatly facilitate palladium-catalyzed alkynylations in batch and continuous-flow conditions"
W. Shu, S. L. Buchwald
Chemical Science **2011**, *2*, 2321–2325

"Ethanol dehydration to ethylene in a stratified autothermal millisecond reactor"
M. J. Skinner, E. L. Michor, W. Fan, M. Tsapatsis, A. Bhan, L. D. Schmidt
ChemSusChem **2011**, *4*, 1151–1156

"High-quality diesel from hexose- and pentose-derived biomass platform molecules"
A. Corma, O. de la Torre, M. Renz
ChemSusChem **2011**, *4*, 1574–1577

"Hydrodesulphurisation of 4,6-dimethyldibenzothiophene over NiMo catalysts supported on Ti(Al) modified MCM-41"
K. Jaroszewska, M. Lewandowski, J. R. Grzechowiak, B. Szyja
Catalysis Today **2011**, *176*, 202–207

"Synthesis of (−)-Oseltamivir by using a microreactor in the Curtius rearrangement"
H. Ishikawa, B. P. Bondzic, Y. Hayashi
European Journal of Organic Chemistry **2011**, 6020–6031

"Efficient and 'green' microwave-assisted synthesis of haloalkylphosphonates *via* the Michaelis–Arbuzov reaction"
P. Jansa, A. Holy, M. Dracinsky, O. Baszczynski, M. Cesnek, Z. Janeba
Green Chemistry **2011**, *13*, 882–888

"Efficient enhancement of copper-pyridineoxazoline catalysts through immobilization and process design"
C. Aranda, A. Cornejo, J. M. Fraile, E. Garcıa-Verdugo, M. J. Gil, S. V. Luis, J. A. Mayoral, V. Martinez-Merino, Z. Ochoa
Green Chemistry **2011**, *13*, 983–990

"Continuous biocatalytic synthesis of (*R*)-2-octanol with integrated product separation"
C. Kohlmann, S. Leuchs, L. Greiner, W. Leitner
Green Chemistry **2011**, *13*, 1430–1436

"Highly selective hydroformylation of long-chain alkenes in a supercritical fluid ionic liquid biphasic system"
T. E. Kunene, P. B. Webb, D. J. Cole-Hamilton
Green Chemistry **2011**, *13*, 1476–1481

"Decision support towards agile eco-design of microreaction processes by accompanying (simplified) life cycle assessment"
S. Huebschmann, D. Kralisch, H. Löwe, D. Breuch, J. H. Petersen, T. Dietrich, R. Scholz
Green Chemistry **2011**, *13*, 1694–1707

"A catalytic route to lower alcohols from glycerol using Ni-supported catalysts"
E. van Ryneveld, A. S. Mahomed, P. S. van Heerden, M. J. Green, H. B. Friedrich
Green Chemistry **2011**, *13*, 1819–1827

"Direct transformation of ethanol into ethyl acetate through catalytic membranes containing Pd or Pd-Zn: comparison with conventional supported catalysts"
A. B. Sanchez, N. Homs, S. Miachon, J.-A. Dalmon, J. L. G. Fierro, P. R. de la Piscina
Green Chemistry **2011**, *13*, 2569–2575

"Tungsten-Vanadium mixed oxides for the oxidehydration of glycerol into acrylic acid"
M. D. Soriano, P. Concepcion, J. M. L. Nieto, F. Cavani, S. Guidetti, C. Trevisanut
Green Chemistry **2011**, *13*, 2954–2962

"Silica-supported guanidine catalyst for continuous flow biodiesel production"
J. M. Balbino, E. W. de Menezes, E. V. Benvenutti, R. Cataluna, G. Ebeling, J. Dupont
Green Chemistry **2011**, *13*, 3111–3116

"JandaJel as a polymeric support to improve the catalytic efficiency of immobilized-1,5,7-triazabicyclo[4.4.0]dec-5-ene (TBD) under solvent-free conditions"
D. Lanari, R. Ballini, S. Bonollo, A. Palmieri, F. Pizzo, L. Vaccaro
Green Chemistry **2011**, *13*, 3181–3186

"Inhibition of gold and platinum catalysts by reactive intermediates produced in the selective oxidation of alcohols in liquid water"
B. N. Zope, R. J. Davis
Green Chemistry **2011**, *13*, 3483–3491

"Microreactor system for high-pressure continuous flow homogeneous catalysis measurements"
J. Keybl, K. F. Jensen
Industrial Engineering Chemistry Research **2011**, *50*, 11013–11022

"Step changes and deactivation behavior in the continuous decarboxylation of stearic acid"
A. T. Madsen, B. Rozmyszowicz, I. L. Simakova, T. Kilpiö, A.-R. Leino, K. Kordas, K. Eränen, P. Mäki-Arvela, D. Y. Murzin
Industrial Engineering Chemistry Research **2011**, *50*, 11049–11058

"Modeling of toluene acetylation with acetic anhydride on H-USY zeolite"
E. A. Dejaegere, J. W. Thybaut, G. B. Marin, G. V. Baron, J. F. M. Denayer
Industrial Engineering Chemistry Research **2011**, *50*, 11822–11832

"Controllable preparation of poly(butyl acrylate) by suspension polymerization in a coaxial capillary microreactor"
Z. Liu, Y. Lu, B. Yang, G. Luo
Industrial Engineering Chemistry Research **2011**, *50*, 11853–11862

"Methanol to gasoline-range hydrocarbons: influence of nanocrystal size and mesoporosity on catalytic performance and product distribution of ZSM-5"
A. A. Rownaghi, J. Hedlund
Industrial Engineering Chemistry Research **2011**, *50*, 11872–11878

"Development of a photochemical microfluidics platform"
K. Pimparkar, B. Yen, J. R. Goodell, V. I. Martin, W.-H. Lee, J. A. Porco, Jr., A. B. Beeler, K. F. Jensen
Journal of Flow Chemistry **2011**, *1*, 53–55

"An integrated synthesis–purification system to accelerate the generation of compounds in pharmaceutical discovery"
J. E. Hochlowski, P. A. Searle, N. P. Tu, J. Y. Pan, S. G. Spanton, S. W. Djuric
Journal of Flow Chemistry **2011**, *1*, 56–61

"A continuous-flow system for asymmetric hydrogenation using supported chiral catalysts"
J. Madarász, G. Farkas, S. Balogh, Á. Szöllősy, J. Kovács, F. Darvas, L. Ürge, J. Bakos
Journal of Flow Chemistry **2011**, *1*, 62–67

"Reissert indole synthesis using continuous-flow hydrogenation"
E. Colombo, P. Ratel, L. Mounier, F. Guillier
Journal of Flow Chemistry **2011**, *1*, 68–73

"Cost analysis for a continuously operated fine chemicals production plant at 10 kg/day using a combination of microprocessing and microwave heating"
F. Benaskar, A. Ben-Abdelmoumen, N. G. Patil, E.V. Rebrov, J. Meuldijk, L. A. Hulshof, V. Hessel, U. Krtschil, J. C. Schouten
Journal of Flow Chemistry **2011**, *1*, 74–89

"White light emission from Mn-doped ZnSe d-dots synthesized continuously in microfluidic reactors"
P. Shao, H. Wang, Q. Zhang, Y. Li
Journal of Materials Chemistry **2011**, *21*, 17972–17977

"Flow reactor synthesis of CdSe, CdS, CdSe/CdS and CdSeS nanoparticles from single molecular precursor(s)"
A. L. Abdelhady, M. Afzaal, M. A. Malik, P. O'Brien
Journal of Materials Chemistry **2011**, *21*, 18768–18775

"Synthesis and biochemical evaluation of Δ2-isoxazoline derivatives as DNA methyltransferase 1 inhibitors"
S. Castellano, D. Kuck, M. Viviano, J. Yoo, F. Lopez-Vallejo, P. Conti, L. Tamborini, A. Pinto, J. L. Medina-Franco, G. Sbardella
Journal of Medicinal Chemistry **2011**, *54*, 7663–7677

"Porous photocatalytic membrane microreactor (P2M2): A new reactor concept for photochemistry"
H. C. Aran, D. Salamon, T. Rijnaarts, G. Mul, M. Wessling, R. G. H. Lammertink
Journal of Photochemistry and Photobiology A: Chemistry **2011**, *225*, 36–41

"Determination of kinetic constants of a photocatalytic reaction in micro-channel reactors in the presence of mass-transfer limitation and axial dispersion"
G. Charles, T. Roques-Carmes, N. Becheikh, L. Falk, J.-M. Commenge, S. Corbel
Journal of Photochemistry and Photobiology A: Chemistry **2011**, *225*, 202–211

"Meerwein–Ponndorf–Verley reduction of aldehydes formed in situ from α- and β-pinene epoxides in a supercritical fluid in the presence of alumina"
I. V. Il'ina, S. Yu. Kurbakova, K. P. Volcho, N. F. Salakhutdinov, V. I. Anikeev
Journal of Saudi Chemical Society **2011**, *15*, 313–317

"Small molecule library synthesis using segmented flow"
C. M. Thompson, J. L. Poole, J. L. Cross, I. Akritopoulou-Zanze, S. W. Djuric
Molecules **2011**, *16*, 9161–9177

"Enantioselective radical cyclisation reactions of 4-substituted quinolones mediated by a chiral template"
A. Bakowski, M. Dressel, A. Bauer, T. Bach
Organic & Biomolecular Chemistry **2011**, *9*, 3516–3529

"Syntheses of mGluR5 PET radioligands through the radiofluorination of diaryliodonium tosylates"
S. Telu, J.-H. Chun, F. G. Simeon, S. Lu, V. W. Pike
Organic & Biomolecular Chemistry **2011**, *9*, 6629–6638

"Perfluoroalkylation in flow microreactors: generation of perfluoroalkyllithiums in the presence and absence of electrophiles"
A. Nagaki, S. Tokuoka, S. Yamada, Y. Tomida, K. Oshiro, H. Amii, J.-i. Yoshida
Organic & Biomolecular Chemistry **2011**, *9*, 7559–7563

"Catalytic conversion of isopropanol and CO oxidation in presence of NiO supported on modified cordierite"
S. A. El-Molla, G. A. El-Shobaky, Y. M. Fahmy, H. G. El-Shobaky
The Open Catalysis Journal **2011**, *4*, 9–17

"Effects of ZnO and MoO_3 doping on surface and catalytic properties of manganese oxide supported on alumina system"
S. M. Ibrahim, G. A. El-Shobaky, G. M. Mohamed, N. A. Hassan
The Open Catalysis Journal **2011**, *4*, 27–35

"The preparation of desflurane by the vapor-phase fluorination of isoflurane"
H. Sivaramakrishnan, A. A. Upare, D. Satagopan, O. R. Chambers
Organic Process Research & Development **2011**, *15*, 585–592

"Controlled RAFT polymerization in a continuous flow microreactor"
C. H. Hornung, C. Guerrero-Sanchez, M. Brasholz, S. Saubern, J. Chiefari, G. Moad, E. Rizzardo, S. H. Thang
Organic Process Research & Development **2011**, *15*, 593–601

"Continuous flow processing of slurries: evaluation of an agitated cell reactor"
D. L. Browne, B. J. Deadman, R. Ashe, I. R. Baxendale, S. V. Ley
Organic Process Research & Development **2011**, *15*, 693–697

"A continuous-flow approach to palladium-catalyzed alkoxycarbonylation reactions"
C. B. Kelly, C. Lee, M. A. Mercadante, N. E. Leadbeater
Organic Process Research & Development **2011**, *15*, 717–720

"Fast scale-up using microreactors: pyrrole synthesis from micro to production scale"
P. J. Nieuwland, R. Segers, K. Koch, J. C. M. van Hest, F. P. J. T. Rutjes
Organic Process Research & Development **2011**, *15*, 783–787

"A scalable two-step continuous flow synthesis of nabumetone and related 4-aryl-2-butanones"
M. Viviano, T. N. Glasnov, B. Reichart, G. Tekautz, C. O. Kappe
Organic Process Research & Development **2011**, *15*, 858–870

"Adaptive process optimization for continuous methylation of alcohols in supercritical carbon dioxide"
R. A. Bourne, R. A. Skilton, A. J. Parrott, D. J. Irvine, M. Poliakoff
Organic Process Research & Development **2011**, *15*, 932–938

"Development of an improved immobilized CAL-B for the enzymatic resolution of a key intermediate to Odanacatib"
M. D. Truppo, G. Hughes
Organic Process Research & Development **2011**, *15*, 1033–1035

"A versatile lab to pilot scale continuous reaction system for supercritical fluid processing"
U. Hintermair, C. Roosen, M. Kaever, H. Kronenberg, R. Thelen, S. Aey, W. Leitner, L. Greiner
Organic Process Research & Development **2011**, *15*, 1275–1280

"Safe, convenient *ortho*-Claisen thermal rearrangement using a flow reactor"
J. A. Rincon, M. Barberis, M. Gonzalez-Esguevillas, M. D. Johnson, J. K. Niemeier, W.-M. Sun
Organic Process Research & Development **2011**, *15*, 1428–1432

"Nitration chemistry in continuous flow using fuming nitric acid in a commercially available flow reactor"
C. E. Brocklehurst, H. Lehmann, L. La Vecchia
Organic Process Research & Development **2011**, *15*, 1447–1453

"UV initiated formation of polymer monoliths in glass and polymer microreactors"
J. A. Deverell, T. Rodemann, J. A. Smith, A. J. Canty, R. M. Guijt
Sensors and Actuators B: Chemical **2011**, *155*, 388–396

"Clean and efficient benzylic C-H oxidation using a microflow system"
X.-M. Lv, L.-J. Kong, Q. Lin, X.-F. Liu, Y.-M. Zhou, Y. Jia
Synthetic Communications **2011**, *41*, 3215–3222

"The continuous-flow synthesis of styrenes using ethylene in a palladium-catalyzed Heck cross-coupling reaction"
S. L. Bourne, P. Koos, M. O'Brien, B. Martin, B. Schenkel, I. R. Baxendale, S. V. Ley
Synlett **2011**, 2642–2647

"Syngas-mediated C–C bond formation in flow: selective rhodium-catalyzed hydroformylation of styrene"
S. Kasinathan, S. L. Bourne, P. Tolstoy, P. Koos, M. O'Brien, R. W. Bates, I. R. Baxendale, S. V. Ley
Synlett **2011**, 2648–2651

"Synthesis of *N*-propynyl analogues of peptide nucleic acid (PNA) monomers and their use in the click reaction to prepare *N*-functionalized PNAs"
N. M. Howarth, J. Ricci
Tetrahedron **2011**, *67*, 9588–9594

"Piecing together the puzzle: understanding a mild, metal free reduction method for the large scale synthesis of hydrazines"
D. L. Browne, I. R. Baxendale, S. V. Ley
Tetrahedron **2011**, *67*, 10269–10303

"Flow chemistry approach for partial deuteration of alkynes: synthesis of deuterated taxol side chain"
S. Chandrasekhar, B. V. D. Vijaykumar, B. M. Chandra, C. R. Reddy, P. Naresh
Tetrahedron Letters **2011**, *52*, 3865–3867

"Copper-catalyzed rearrangement of oximes into primary amides"
S. K. Sharma, S. D. Bishopp, C. L. Allen, R. Lawrence, M. J. Bamford, A. A. Lapkin, P. Plucinski, R. J. Watson, J. M. J. Williams
Tetrahedron Letters **2011**, *52*, 4252–4255

"Application of flow chemistry to the reduction of nitriles to aldehydes"
J. de M. Muñoz, J. Alcázar, A. de la Hoz, A. Díaz-Ortiz
Tetrahedron Letters **2011**, *52*, 6058–6060

"A continuous-flow synthesis of annulated and polysubstituted furans from the reaction of ketones and α-haloketones"
M. York
Tetrahedron Letters **2011**, *52*, 6267–6270

"*p*-Iodinations in hydrocarbon media: continuous flow reactor application"
D. W. Slocum, K. C. Tekin, Q. Nguyen, P. E. Whitley, T. K. Reinscheld, B. Fouzia
Tetrahedron Letters **2011**, *52*, 7141–7145

Reviews

“Coupled chemo(enzymatic) reactions in continuous flow”
R. Yuryev, S. Strompen, A. Liese
Beilstein Journal of Organic Chemistry **2011**, *7*, 1449–1467

“The microwave-to-flow paradigm: translating high-temperature batch microwave chemistry to scalable continuous-flow processes”
T. N. Glasnov, C. O. Kappe
Chemistry A European Journal **2011**, *17*, 11956–11968

“(Bio)Catalytic continuous flow processes in $scCO_2$ and/or ILs: towards sustainable (bio)catalytic synthetic platforms”
P. Lozano, E. Garcia-Verdugo, S. V. Luis, M. Pucheault, M. Vaultier
Current Organic Synthesis **2011**, *8,* 810–823

“Enzyme-immobilized microfluidic process reactors”
Y. Asanomi, H. Yamaguchi, M. Miyazaki, H. Maeda
Molecules **2011**, *16*, 6041–6059

“Microfluidic devices: useful tools for bioprocess intensification”
M. P. C. Marques, P. Fernandes
Molecules **2011**, *16*, 8368–8401

“Microfluidic Bioreactors for Cell Culturing: A Review”
G. Pasirayi, V. Auger, S. M. Scott, P. K. S. M. Rahman, M. Islam, L. O’Hare, Z. Ali
Micro and Nanosystems **2011**, *3,* 137–160

“Monolithic flow microreactors improve fine chemicals synthesis”
A. Sachse, A. Galarneau, B. Coq, F. Fajula
New Journal of Chemistry **2011**, *35*, 259–264