Highlights from the Flow Chemistry Literature 2015 (Part 3)

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In this section of the journal, the literature on continuous-flow synthesis (primarily organic synthesis and functional materials) from the period of July to September 2015 is presented. All the publications are listed and ordered by journal name, with a few review articles appearing at the end. With a few special issues related to flow synthesis and advances in organic process development, the number of publications on flow synthesis has grown steadily in this period. This also shows the growing interest of the community in adapting to flow synthesis.

Highlighted Articles

Machine–Assisted Organic Synthesis
S. V. Ley, D. E. Fitzpatrick, R. M. Myers, C. Battilocchio, R. Ingham

Angewandte Chemie International Edition **2015**, *54*, 10122–10136

This is an excellent perspective article on the way chemistry will be practiced in the time to come. The authors hail the application of various machine-based technologies in organic synthesis. With several successful examples on synthesis, screening, monitoring, control, and analysis, all on automated platforms, the speed of work is expected to enhance significantly. Self-optimizing systems coupled with intelligent algorithms is probably the next evolution in the synthesis chemistry. While the authors seem a little conservative on the time scale needed to adapt to such technologies as it will need a significant change of mindset, they give a silver lining of how we have adapted to new technologies in our day to day life. It is expected that the chemistry community would show similar hunger for efficient approaches.

Continuous-Flow Synthesis of a Carbon-Based Molecular Cage Macrocycle via a Three-Fold Homocoupling Reaction
M. Kitchin, K. Konstas, C. J. Sumby, M. L. Czyz, P. Valente, M. R. Hill, C. J. Doonan

Chemical Communications **2015**, *51*, 14231–14234

A novel synthesis of the cage molecule ($C_{110}H_{56}Br_2$) via a remarkable three-fold homocoupling macrocyclization reaction is reported under flow conditions. The approach yields a porous organic cage compound flow synthesis, and the authors have shown it to be a scalable technology producing multigram-scale consistent shape of the delicate cage molecules. The homogeneous phase synthesis is further expected to use the $Cu(OAc)_2$ and CuCl in an immobilized form, and even the excess reagents involved in batch synthesis are expected to reduce significantly, making it a greener process.

Automated Serendipity with Self-Optimizing Continuous-Flow Reactors
Z. Amara, E. S. Streng, R. A. Skilton, J. Jin, M. W. George, M. Poliakoff

European Journal of Organic Chemistry **2015**, *2015*, 6141–6145

This is a spectacular work where the optimization approach is used to correct the synthesis protocol on its own to screen the synthesis conditions that give known and unknown materials from a set of reactants and reagents under supercritical conditions. The authors have reported the formation of methylated anilines/carbamate derivatives and unusual addition products with THF including pyrrolidines and *N*-alkylated anilines. A few optimization approaches are correlated to find the effect on expected synthesis. In general, the starting condition is found to affect the product distribution, which is verified for its consistency by deliberately applying errors in the synthesis. This approach is the next step in organic synthesis where the chemists would get more time to think on mechanisms rather than the routine works, which eventually will accelerate the evolution.

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DOI: 10.1556/1846.2015.00042

J. Flow Chem. **2015,** 5(4), 241–247
First published online: 28 November 2015

Organic Synthesis

"Organo-chlorinated thin films deposited by atmospheric pressure plasma-enhanced chemical vapor deposition for adhesion enhancement between rubber and zinc-plated steel monofilaments"
C. Vandenabeele, S. Bulou, R. Maurau, F. Siffer, T. Belmonte, P. Choquet
ACS Applied Materials & Interfaces **2015**, *7*, 14317–14327

"Translating the enantioselective michael reaction to a continuous flow paradigm with an immobilized, fluorinated organocatalyst"
I. Sagamanova, C. Rodrïguez-Escrich, I. G. Molnár, S. Sayalero, R. Gilmour, M. A. Pericàs
ACS Catalysis **2015**, *5*, 6241–6248

"Continuous flow metathesis for direct valorization of food waste: an example of cocoa butter triglyceride"
C. Schotten, D. Plaza, S. Manzini, S. P. Nolan, S. V. Ley, D. L. Browne, A. Lapkin
ACS Sustainable Chemistry & Engineering **2015**, *3*, 1453–1459

"Construction of 2-(2′-hydroxy-5′-methylphenyl) benzotriazole over Pd/γ-Al_2O_3 by a continuous process"
B. Wang, W. Fang, L. Si, Y. Li, X. Yan, L. Chen, S. Wang
ACS Sustainable Chemistry & Engineering **2015**, *3*, 1890–1896

"Separation of conglomerate forming enantiomers using a novel continuous preferential crystallization process"
T. Vetter, C. L. Burcham, M. F. Doherty
AIChE Journal **2015**, *61*, 2810–2823

"On-chip dilution in nanoliter droplets"
R. Thakur, A. M. Amin, S. Wereley
Analyst **2015**, *140*, 5855–5859

"Flow and microwave-assisted synthesis of N-(triethylene glycol) glycine oligomers and their remarkable cellular transporter activities"
T. Jong, A. M. Pérez-López, E. M. V. Johansson, A. Lilienkampf, M. Bradley
Bioconjugate Chemistry **2015**, *26*, 1759–1765

"One-pot reductive amination of aldehydes with nitroarenes over an Au/Al_2O_3 catalyst in a continuous flow reactor"
E. A. Artiukha, A. L. Nuzhdin, G. A. Bukhtiyarova, S. Y. Zaytsev, P. E. Plyusnin, Y. V. Shubin, V. I. Bukhtiyarov
Catalysis Science & Technology **2015**, *5*, 4741–4745

"Continuous poly (2-oxazoline) triblock copolymer synthesis in a microfluidic reactor cascade"
E. Baeten, B. Verbraeken, R. Hoogenboom, T. Junkers
Chemical Communications **2015**, *51*, 11701–11704

"Continuous flow of nitroso Diels–Alder reaction"
E. Nakashima, H. Yamamoto
Chemical Communications **2015**, *51*, 12309–12312

"Large-scale continuous hydrothermal production and activation of ZIF-8"
A. S. Munn, P. W. Dunne, S. V. Y. Tang, E. H. Lester
Chemical Communications **2015**, *51*, 12811–12814

"Low temperature *in situ* Raman spectroscopy of an electro-generated arylbis(arylthio)sulfonium ion"
K. Matsumoto, Y. Miyamoto, K. Shimada, Y. Morisawa, H. Zipse, S. Suga, Jun-ichi Yoshida, S. Kashimura, and T. Wakabayashi
Chemical Communications **2015**, *51*, 13106–13109

"Simultaneous solvent screening and reaction optimization in microliter slugs"
B. J. Reizman, K. F. Jensen
Chemical Communications **2015**, *51*, 13290–13293

"Continuous synthesis of methanol: heterogeneous hydrogenation of ethylene carbonate over Cu/HMS catalysts in a fixed bed reactor system"
X. Chen, Y. Cui, C. Wen, B. Wang, W. L. Dai
Chemical Communications **2015**, *51*, 13776–13778

"Continuous flow synthesis of a carbon-based molecular cage macrocycle via a three-fold homocoupling reaction"
M. Kitchin, K. Konstas, C. J. Sumby, M. L. Czyz, P. Valente, M. R. Hill, C. J. Doonan
Chemical Communications **2015**, *51*, 14231–14234

"Continuous crystallization of ZnO nanoparticles by spray flash evaporation versus batch synthesis"
M. Klaumünzer L. Schlur, F. Schnell, D. Spitzer
Chemical Engineering & Technology, *38*, 1477–1484

"Continuous synthesis and thermal elimination of sulfinyl-route poly (p-phenylene vinylene) in consecutive flow reactions"
N. Zaquen, E. Baeten, J. Vandenbergh, L. Lutsen, D. Vanderzande, T. Junkers
Chemical Engineering & Technology **2015**, *38*, 1749–1757

"Effect of process parameters on properties of colloids in a continuous-flow microreactor system"
S. H. Sonawane, M. L. Bari, P. L. Suryawanshi, J. S. Narkhede, S. Mishra, B. A. Bhanvase
Chemical Engineering & Technology **2015**, *38*, 1765–1773

"Continuous flow polymer synthesis toward reproducible large-scale production for efficient bulk heterojunction organic solar cells"
G. Pirotte, J. Kesters, P. Verstappen, S. Govaerts, J. Manca, L. Lutsen, W. Maes
ChemSusChem **2015**, *8*, 3228–3233

"Gas–liquid segmented flow microwave-assisted synthesis of MOF-74 (Ni) under moderate pressures"
G. H. Albuquerque, R. C. Fitzmorris, M. Ahmadi, N. Wannenmacher, P. K. Thallapally, B. P. McGrail, G. S. Herman
CrystEngComm **2015**, *17*, 5502–5510

"Continuous synthesis of dispersant-coated hydroxyapatite plates"
M. Gimeno-Fabra, F. Hild, P. W. Dunne, K. Walton, D. M. Grant, D. J. Irvine, E. H. Lester
CrystEngComm **2015**, *17*, 6175–6182

"Nucleation studies of active pharmaceutical ingredients in an air-segmented microfluidic drop-based crystallizer"
J. Lu, J. D. Litster, Z. K. Nagy
Crystal Growth & Design **2015**, *15*, 3645–3651

"Nucleation and growth of cobalt oxide nanoparticles in a continuous hydrothermal reactor under laminar and turbulent flow"
C. J. Denis, C. J. Tighe, R. I. Gruar, N. M. Makwana, J. A. Darr
Crystal Growth & Design **2015**, *15*, 4256–4265

"Continuous spherical crystallization of albuterol sulfate with solvent recycle system"
K. Tahara, M. O'Mahony, A. S. Myerson
Crystal Growth & Design **2015**, *15*, 5149–5156

"Pilot-scale fluidized-bed co-gasification of palm kernel shell with sub-bituminous coal"
C. F. Valdés, G. Marrugo, F. Chejne, J. I. Montoya, C. A. Gómez
Energy & Fuels **2015**, *29*, 5894–5901

"Hydrothermal liquefaction of microalgae in a continuous stirred-tank reactor"
D. López Barreiro, B. Ríos Gómez, U. Hornung, A. Kruse, W. Prins
Energy & Fuels **2015**, *29*, 6422–6432

"Automated serendipity with self-optimizing continuous-flow reactors"
Z. Amara, E. S. Streng, R. A. Skilton, J. Jin, M. W. George, M. Poliakoff
European Journal of Organic Chemistry **2015**, *2015*, 6141–6145

"Influence of microphase morphology and long-range ordering on foaming behavior of PE-b-PEO diblock copolymers"
Y. Xu, T. Liu, W.-k. Yuan, L. Zhao
Industrial & Engineering Chemistry Research **2015**, *54*, 7113–7121

"Insights into the Diels–Alder reactions between cyclopentadiene and 1, 3-butadiene with high temperature and high pressure"
K. Cao, X. Liu, Y. Zhang, J.-l. Shi, Y.-x. Song, Z. Yao
Industrial & Engineering Chemistry Research **2015**, *54*, 7565–7570

"Enzymatic fatty acid hydroxylation in a liquid–liquid slug flow microreactor"
I. Iliuta, A. Garnier, M. C. Iliuta
Industrial & Engineering Chemistry Research **2015**, *54*, 7787–7799

"Development of a dual-stage continuous flow reactor for hydrothermal synthesis of hybrid nanoparticles"
H. L. Hellstern, J. Becker, P. Hald, M. Bremholm, A. Mamakhel, B. B. Iversen
Industrial & Engineering Chemistry Research **2015**, *54*, 8500–8508

"A Tandem, bicatalytic continuous flow cyclopropanation-homo-Nazarov-type cyclization"
J. Aponte-Guzmán, R. Shenje, Y. Huang, W. H. Woodham, S. R. Saunders, S. M. Mostaghimi K. R. Flack, P. Pollet, C. A. Eckert, C. L. Liotta, S. France
Industrial & Engineering Chemistry Research **2015**, *54*, 9550–9558

"Heterocyclization approach for electrooxidative coupling of functional primary alkylamines with aromatics"
T. Morofuji, A. Shimizu, Jun-ichi Yoshida
Journal of the American Chemical Society **2015**, *137*, 9816–9819

"Recent advances in continuous rhodium-catalyzed hydroformylation"
X. Wang
Journal of Flow Chemistry **2015**, *5*, 125–132

"Continuous-flow synthesis and purification of atropine with sequential in-line separations of structurally similar impurities"
C. Dai, D. R. Snead, P. Zhang, T. F. Jamison
Journal of Flow Chemistry **2015**, *5*, 133–138

"Rapid-flow synthesis of Zn–Qn complexes: teaching old ligands new tricks with reactive $Na_2(HZnEt_2)_2$"
L. Z. Miller, J. J. Hrudka, Y. R. Naro, M. Haaf, M. Shatruk, D. T. McQuade
Journal of Flow Chemistry **2015**, *5*, 139–141

"Efficient continuous-flow synthesis of macrocyclic triazoles"
A. Bédard, J. Santandrea, S. K. Collins
Journal of Flow Chemistry **2015**, *5*, 142–144

"A flow-based synthesis of telmisartan"
A. D. Martin, A. R. Siamaki, K. Belecki, B. F. Gupton
Journal of Flow Chemistry **2015**, *5*, 145–147

"The preparation of ethyl levulinate facilitated by flow processing: the catalyzed and uncatalyzed esterification of levulinic acid"
M. P. Negus, A. C. Mansfield, N. E. Leadbeater
Journal of Flow Chemistry **2015**, *5*, 148–150

"Protein and antibody functionalization using continuous flow microreactor technology"
M. M. Sebeika, N. G. Gedeon, S. Sadler, N. L. Kern, D. J. Wilkins, D. E. Bell, G. B. Jones
Journal of Flow Chemistry **2015**, *5*, 151–154

"Development of a photolabile amine protecting group suitable for multistep flow synthesis"
H. Yueh, A. Voevodin, A. B. Beeler
Journal of Flow Chemistry **2015**, *5*, 155–159

"Mass transfer characteristics of ozonolysis in microreactors and advanced-flow reactors"
M. J. Nieves-Remacha, K. F. Jensen
Journal of Flow Chemistry **2015**, *5*, 160–165

"When solids stop flow chemistry in commercial tubing"
Y. Chen, J. C. Sabio, R. L. Hartman
Journal of Flow Chemistry **2015**, *5*, 166–171

"An efficient and more sustainable one-step continuous-flow multicomponent synthesis approach to chromene derivatives"
B. Reddy Vaddula, S. Yalla, M. A. Gonzalez
Journal of Flow Chemistry **2015**, *5*, 172–177

"Microreactor flow synthesis of the secondary high explosive 2,6-diamino-3,5-dinitropyrazine-1-oxide (LLM-105)"
N. B. Zuckerman, M. Shusteff, P. F. Pagoria, A. E. Gash
Journal of Flow Chemistry **2015**, *5*, 178–182

"Moffat–Swern oxidation of alcohols: translating a batch reaction to a continuous-flow reaction"
O. Bleie, M. F. Roberto, T. I. Dearing, C. W. Branham, O. M. Kvalheim, B. J. Marquardt
Journal of Flow Chemistry **2015**, *5*, 183–189

"Continuous processing of active pharmaceutical ingredients suspensions via dynamic cross-flow filtration"
J. Gursch, R. Hohl, G. Toschkoff, D. Dujmovic, J. Brozio, M. Krumme, J. Khinast
Journal of Pharmaceutical Sciences **2015**, *104*, 3481–3489

"Continuous flow synthesis of poly (methyl methacrylate) via a light-mediated controlled radical polymerization"
A. Melker, B. P. Fors, C. J. Hawker, J. E. Poelma
Journal of Polymer Science Part A: Polymer Chemistry **2015**, *53*, 2693–2698

"LoMA-B: a simple and versatile lab-on-a-chip system based on single-channel bisulfate conversion for DNA methylation analysis"
J. Yoon, M. K. Park, T. Y. Lee, Y. J. Yoon, Y. Shin
Lab on a Chip **2015**, *15*, 3530–3539

"Continuous microwave flow synthesis (CMFS) of nanosized titania: structural, optical and photocatalytic properties"
M. Akram, F. K. Butt, A. Z. Alshemary, Y.-F. Goh, W. A. W. Ibrahim, R. Hussain
Materials Letters **2015**, 158, 95–98

"Continuous microwave flow synthesis of mesoporous hydroxyapatite"
M. Akram, A. Z. Alshemary, Y.-F. Goh, W. A. W. Ibrahim, H. O. Lintang, R. Hussain
Materials Science and Engineering: C **2015**, 56, 356–362

"Copper-catalysed azide–alkyne cycloadditions (CuAAC): an update"
E. Haldón, M. C. Nicasio, P. J. Pérez
Organic & Biomolecular Chemistry **2015**, *13*, 9528–9550

"Visible-light photoredox catalysis: direct synthesis of fused β-carbolines through an oxidation/[3 + 2] cycloaddition/oxidative aromatization reaction cascade in batch and flow microreactors"
D. Chandrasekhar, S. Borra, J. S. Kapure, G. S. Shivaji, G. Srinivasulu, R. A. Maurya
Organic Chemistry Frontiers **2015**, *2*, 1308–1312

"Generation and ring opening of aziridines in telescoped continuous flow processes"
N. Hsueh, G. J. Clarkson, M. Shipman
Organic Letters **2015**, *17*, 3632–3635

"Homogeneous gold-catalyzed glycosylations in continuous flow"
S. Matthies, D. T. McQuade, P. H. Seeberger
Organic Letters **2015**, *17*, 3670–3673

"Domino hydrogenation–reductive amination of phenols, a simple process to access substituted cyclohexylamines"
V. R. Jumde, E. Petricci, C. Petrucci, N. Santillo, M. Taddei, L. Vaccaro
Organic Letters **2015**, *17*, 3990–3993

"Intensified co-oligomerization of propylene oxide and carbon dioxide in a continuous heat exchanger loop reactor at elevated pressures"
J. Langanke, A. Wolf
Organic Process Research & Development **2015**, *19*, 735–739

"Continuous-flow synthesis of meta-substituted phenol derivatives"
J. H. Park, C. Y. Park, M. J. Kim, M. U. Kim, Y. J. Kim, G.-H. Kim, C. P. Park
Organic Process Research & Development **2015**, *19*, 812–818

"Investigating scale-up and further applications of DABAL-Me_3 promoted amide synthesis"
D. S. Lee, Z. Amara, M. Poliakoff, T. Harman, G. Reid, B. Rhodes, S. Brough, T. McInally, S. Woodward
Organic Process Research & Development **2015**, *19*, 831–840

"PTFE-membrane flow reactor for aerobic oxidation reactions and its application to alcohol oxidation"
J. F. Greene, Y. Preger, S. S. Stahl, T. W. Root
Organic Process Research & Development **2015**, *19*, 858–864

"Exceptionally stable and efficient solid supported Hoveyda-type catalyst"
K. Skowerski, J. Pastva, S. J. Czarnocki, J. Janoscova
Organic Process Research & Development **2015**, *19*, 872–877

"Continuous-flow process for the synthesis of 2-ethylphenylhydrazine hydrochloride"
Z. Yu, G. Tong, X. Xie, P. Zhou, Y. Lv, W. Su
Organic Process Research & Development **2015**, *19*, 892–896

"Development of a continuous flow sulfoxide imidation protocol using azide sources under superacidic conditions"
B. Gutmann, P. Elsner, A. O'Kearney-McMullan, W. Goundry, D. M. Roberge, C. O. Kappe
Organic Process Research & Development **2015**, *19*, 1062–1067

"Continuous-flow nitration of o-xylene: effect of nitrating agent and feasibility of tubular reactors for scale-up"
Y. Sharma, R. A. Joshi, A. A. Kulkarni
Organic Process Research & Development **2015**, *19* , 1138–1147

"Oscillatory flow reactors (OFRs) for continuous manufacturing and crystallization"
T. McGlone, N. E. B. Briggs, C. A. Clark, C. J. Brown, J. Sefcik, A. J. Florence
Organic Process Research & Development **2015**, *19*, 1186–1202

"Development of pilot-scale continuous production of an LY2886721 starting material by packed-bed hydrogenolysis"
N. Zaborenko, R. J. Linder, T. M. Braden, B. M. Campbell, M. M. Hansen, M. D. Johnson
Organic Process Research & Development **2015**, *19*, 1231–1243

"Polymerization of vinyl ethers initiated by dendritic cations using flow microreactors"
A. Nagaki, M. Takumi, Y. Tani, and Jun-ichi Yoshida
Tetrahedron, **2015**, *71*, 5973–5978

"Study for diastereoselective aldol reaction in flow: synthesis of (E)-(S)-3-hydroxy-7-tritylthio-4-heptenoic acid, a key component of cyclodepsipeptide HDAC inhibitors"
T. Doi, H. Otaka, K. Umeda, M. Yoshida
Tetrahedron **2015**, *71*, 6463–6470

"Continuous flow reactions in water for the synthesis of propargylamines via a metal-free decarboxylative coupling reaction"
B. Jung, K. Park, K. H. Song, S. Lee
Tetrahedron Letters **2015**, *56*, 4697–4700

"Pyrolysis of cyclopentadienone: mechanistic insights from a direct measurement of product branching ratios"
T. K. Ormond, A. M. Scheer, M. R. Nimlos, D. J. Robichaud, T. P. Troy, M. Ahmed, J. W. Daily, T. L. Nguyen, J. F. Stanton, G. B. Ellison
The Journal of Physical Chemistry A **2015**, *119*, 7222–7234

"Experimental and modeling investigation of the low-temperature oxidation of dimethyl ether"
A. Rodriguez, O. Frottier, O. Herbinet, R. Fournet, R. Bounaceur, C. Fittschen, F. Battin-Leclerc
The Journal of Physical Chemistry A **2015**, *119*, 7905–7923

"Influence of He and Ar flow rates and NaCl concentration on the size distribution of bubbles generated by power ultrasound"
R. Pflieger, J. Lee, S. I. Nikitenko, M. Ashokkumar
The Journal of Physical Chemistry B **2015**, *119*, 12682–12688

"Impact of deactivation phenomena on kinetics of the C–N coupling reaction over supported Cu_2O catalysts in continuous-flow conditions"
B. Jurca, A. Tirsoaga, P. Granger, V. I. Parvulescu
The Journal of Physical Chemistry C **2015**, *119*, 18422–18433

"Continuous and discontinuous dynamic crossover in supercooled water in computer simulations"
Z. Ma, J. Li, F. Wang
The Journal of Physical Chemistry Letters **2015**, *6*, 3170–3174

"The synthesis of cadmium sulfide nanoplatelets using a novel continuous flow sonochemical reactor"
B. Palanisamy, B. Paul, C.-h. Chang
Ultrasonics Sonochemistry **2015**, *26*, 452–460

Nanomaterials

"MnO_x nanoparticle-dispersed CeO_2 nanocubes: a remarkable heteronanostructured system with unusual structural characteristics and superior catalytic performance"
S. Putla, M. H. Amin, B. M. Reddy, A. Nafady, K. A. A. Farhan, S. K. Bhargava
ACS Applied Materials & Interfaces **2015**, *7*, 16525–16535

"Interference-free micro/nanoparticle cell engineering by use of high-throughput microfluidic separation"
D. C. Yeo, C. Wiraja, Y. Zhou, H. M. Tay, C. Xu, H. W. Hou
ACS Applied Materials & Interfaces **2015**, *7*, 20855–20864

"Flow effects on the controlled growth of nanostructured networks at microcapillary walls for applications in continuous flow reactions"
G. Wang, C. Yuan, B. Fu, L. He, E. Reichmanis, H. Wang, Q. Zhang, Y. Li
ACS Applied Materials & Interfaces **2015**, *7*, 21580–21588

"Strong carbon nanotube fibers by drawing inspiration from polymer fiber spinning"
B. Alemán, V. Reguero, B. Mas, J. J. Vilatela
ACS Nano **2015**, *9*, 7392–7398

"Synthesis of nickel nanoparticles by aqueous reduction in continuous flow microreactor"
L. Xu, C. Srinivasakannan, J. Peng, D. Zhang, G. Chen
Chemical Engineering and Processing: Process Intensification **2015**, 93, 44–49

"Oscillatory microprocessor for growth and in situ characterization of semiconductor nanocrystals"
M. Abolhasani, C. W. Coley, L. Xie, O. Chen, M. G. Bawendi, K. F. Jensen
Chemistry of Materials **2015**, *27*, 6131–6138

"Effect of seed age on gold nanorod formation: a microfluidic, real-time investigation"
J. Watt, B. G. Hance, R. S. Anderson, D. L. Huber
Chemistry of Materials **2015**, *27*, 6442–6449

"Hydrothermal synthesis and in situ powder X-ray diffraction study of bismuth-substituted ceria nanoparticles"
K. Houlberg, E. D. Bøjesen, C. Tyrsted, A. Mamakhel, X. Wang, R. Su, F. Besenbacher, B. B. Iversen
Crystal Growth & Design **2015**, *15*, 3628–3636

"Highly oxidized multifunctional organic compounds observed in tropospheric particles: a field and laboratory study"
A. Mutzel, L. Poulain, T. Berndt, Y. Iinuma, M. Rodigast, O. Bóge, S. Richters, G. Spindler, M. Sipilá, T. Jokinen, M. Kulmala, H. Herrmann
Environmental Science & Technology **2015**, *49*, 7754–7761

"Phosphate detection through a cost-effective carbon black nanoparticle-modified screen-printed electrode embedded in a continuous flow system"
D. Talarico, S. Cinti, F. Arduini, A. Amine, D. Moscone, G. Palleschi
Environmental Science & Technology **2015**, *49*, 7934–7939

"An ultrahigh precision, high-frequency dissolved inorganic carbon analyzer based on dual isotope dilution and cavity ring-down spectroscopy"
K. Huang, N. Cassar, B. Jonsson, W.-j. Cai, M. L. Bender
Environmental Science & Technology **2015**, *49*, 8602–8610

"Selective enrichment establishes a stable performing community for microbial electrosynthesis of acetate from CO_2"
S. A. Patil, J. B. A. Arends, I. Vanwonterghem, J. v. Meerbergen, K. Guo, G. W. Tyson, K. Rabaey
Environmental Science & Technology **2015**, *49*, 8833–8843

"A direct and continuous supercritical water process for the synthesis of surface-functionalized nanoparticles"
R. I. Gruar, C. J. Tighe, P. Southern, Q. A. Pankhurst, J. A. Darr
Industrial & Engineering Chemistry Research **2015**, *54*, 7436–7451

"Development of a dual-stage continuous flow reactor for hydrothermal synthesis of hybrid nanoparticles"
H. L. Hellstern, J. Becker, P. Hald, M. Bremholm, A. Mamakhel, B. B. Iversen
Industrial & Engineering Chemistry Research **2015**, *54*, 8500–8508

"Structural and optical characterization of $CuInS_2$ quantum dots synthesized by microwave-assisted continuous flow methods"
R. C. Fitzmorris, R. P. Oleksak, Z. Zhou, B. D. Mangum, J. N. Kurtin, G. S. Herman
Journal of Nanoparticle Research **2015**, *17*, 1–10

"Continuous flow formulation and functionalization of magnesium di-hydroxide nanorods as a clean nano-fire extinguisher"
S. Elbasuney, S. F. Mostafa
Powder Technology **2015**, *278*, 72–83

Reviews

"Machine-assisted organic synthesis"
S. V. Ley, D. E. Fitzpatrick, R. M. Myers, C. Battilocchio, R. Ingham
Angewandte Chemie International Edition **2015**, *54*, 10122–10136

"The synthesis of active pharmaceutical ingredients (APIs) using continuous flow chemistry"
M. Baumann, I. R. Baxendale
Beilstein Journal of Organic Chemistry **2015**, *11, 1194–1219*

"Nanocatalysis in flow"
R. Ricciardi, J. Huskens, W. Verboom
ChemSusChem **2015**, *8*, 2586–2605

"Photochemistry in flow"
A. B. Beeler, S. R. Corning
Photochemistry **2015**, *43*, 175

"Recent trends in using single-drop microextraction and related techniques in green analytical methods"
J. M. Kokosa
TrAC Trends in Analytical Chemistry **2015**, *71*, 194–204