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New Microporous Polystyrene Sulfonic Acid Catalyst for Free Fatty Acid Esterification

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IEX 2012: The International Ion Exchange Conference

19 - 21 September 2012
Queens' College, University of Cambridge, UK

Organised by SCI's Separation Science and Technology Group



Wednesday 19 September

08:00 Registration and refreshments

08:45 **Welcome and introduction**

Michael Cox

09:00 **Plenary Lecture** (Chair: Michael Cox)

From the Donnan Membrane Principle to sustainable ion exchange processes and materials: a tribute to Fred G. Donnan

A. K. SenGupta, Lehigh University, USA

10:00 **Keynote Lecture** (Chair: Michael Cox)

European regulatory requirements for synthetic, organic, ion exchangers and adsorbents in food processing and potable water production

M-R. Diebold, Dow, Germany; C. Andersson, CEFIC, Belgium; G. Hamsen, Lanxess, Germany; V. Scilletta, Resindion, Italy; B. Windsor, Purolite, UK

10:30 Refreshments

Session A

Water treatment (1)

Tribute to Prof Wolfgang Hoell

Chair: Brian Windsor

Session B

Bioprocessing

Chair: Sharon Williams

11:00 **Temporary requirement for demineralised water in large power stations, oil refineries and other industrial sites**

V. Skinner, Omobile, UK

Challenges for ion exchange chromatography in high titre monoclonal antibody manufacturing processes

L. Allen, Lonza Biologics plc, UK

11:30 **Shell-core ion exchange resin developments**

W. Fries, Purolite, USA

Ion exchange as an integral part of antibody and non-antibody purification processes

W. Lewis, GlaxoSmithKline, UK

12:00 **The regeneration efficiency of shallow shell resins versus classical strong acid cations in demineralisation process**

C. M. Iesan and C. M. Bohdana, Purolite, Romania; F. Boodoo, Purolite, USA; A. M. S. Oancea, University Politehnica of Burcharest, Romania

Applying ion exchange chromatography in biopharmaceutical protein purification

J. Liddell, FujiFilms Diosynth Biotechnology, UK

12:30 **Production of high purity water from tap water by electrodeionisation**

O. Arar, U. Yuksel and N. Kabay, Ege University, Turkey

Purification of PEGylated Proteins by Ion Exchange Chromatography

E. Mueller, Tosoh Bioscience, Germany

13:00 Lunch

Water treatment (2)

Chair: K. Clive Thompson

Bioprocessing

Chair: Sharon Williams

14:00 **Ionic transport selectivity in electro-deionisation**

N. Emery, ELGA, UK

Title tba

Speaker tba

Session A

14:30 Selective ions rejection by nanofiltration processes in potable water treatments

N. Pages and M. Reig, Polytechnic University of Catalonia, Spain; A. Yaroshchuk, University of Catalonia and ICREA, Spain; J. L. Cortina, Polytechnic University of Catalonia and CETAQUA, Spain

15:00 Arsenic removal from groundwater by adsorbents

J. Park, S. Shao, S. Nishihama and K. Yoshizuka, University of Kitakyushu, Japan

15:30 Batch and column studies for the removal of Pb(II) using a weak acidic ion exchanger: kinetics, equilibrium and breakthrough curves

I. Vergili, G. Soltobaeva, Y. Kaya, Z. Beril Gonder, S. Cavus and G. Gurdag, Istanbul University, Turkey

16:00 Developments in the control and design of 'Nitreat®' Nitrate removal plants during AMP4 and AMP5 at Anglian Water

P. Barratt, Anglian Water Services, UK and R. Ingham, ACWA Services Ltd, UK

16:30 Refreshments

17:00 Poster session

18:00 Drinks reception

19:00 Dinner at Queens' College (non-residents please book in advance)

Thursday 20 September

Session A

Nuclear applications

Chair: Sarah Price

08:30 Resin use, specification and justification at EDF

D. Mascarenhas, F. Gressier and S. Tautier, EDF, France

09:00 Sequestration resins for accelerating removal of radioactive contaminants

P. L. Frattini, D. M. Wells and S. E. Garcia, EPRI, USA; L. Yengoyan, San Jose State University, USA; R. Asay and R. Kohlmann, Radiological Solutions Inc., USA

Session B

Chromatography fouling in the manufacture of vaccine and therapeutic protein products

D. Bracewell, University College London, UK

Title tba

G. Eschbach, Merck Millipore, France

Title tba

Speaker tba, GE Healthcare

Session B

Hydrometallurgy

Tribute to David Naden

Chair: Michael Cox

Developments in the use of ion exchange in hydrometallurgy

M.H. Kotze, Mintek, South Africa

Durability of ion exchange resins for the recovery of uranium via resin-in-pulp

T. Udayar, Z. Shange, M.H. Kotze and O. Yahorava, Mintek, South Africa

Session A

9:30 The removal of cesium ion with natural itaya zeolite and the ion exchange characteristics
M. Endo, N. Takizawa, E. Yoshikawa, N. Muramatsu, T. Kawai and H. Unuma, Yamagata University, Japan; A. Masano, Y. Takeyama and T. Kahara, Zeeklite Co. Ltd, Japan

10:00 The assessment of possibility of use of natural and modified aluminosilicates for rehabilitation of radioactive contaminated territories
A. V. Voronina, V. S. Semenischev, A .A. Bykov, A. S. Kutergin, T. A. Nedobuh and N. D. Betenekov, Ural Federal University, Russia

10:30 Cation exchange behaviour of hydrazine and ammonia on electrically regenerated ion exchange membranes and several polymeric cation exchange resins
J. Greene, O. Cunningham and A. Hill-Wilson, EDF Generation, UK

11:00 Refreshments

Condensate polishing
Chair: Chris Bates

11:30 US BWR condensate polishing optimisation
S. E. Garcia, EPRI, USA; J. F. Giannelli and M. L. Jarvis, Finetech Inc., USA

12:00 The effect of dimethylamine (DMA) on the performance of condensate polishing plant resins at Hartlepool Power Station
S. Price and C. Atkinson, EDF, UK

12:30 The performance of oil-fouled ion exchange resin in the condensate polishing plant of Dungeness B Power Station
S. Price, EDF, UK

13:00 Lunch

Session B

Impact of silica on the adsorption and elution of uranium
K. Soldenhoff, T. Safinski, M.T. Tran and S. Archer, ANSTO, Australia

Molecular recognition technology separations of metallurgical interest
N. E. Izatt, S. R. Izatt and R. L. Bruening, IBC Advanced Technologies, USA

The hybrid correlation and its application to a nickel resin-in-pulp circuit
B. McKevitt, P. Abbasi and D. Dreisinger, University of British Columbia, Canada

Catalysis
Chair: Kevin Blaxall

Synthesis of n-hexyl acetate in batch and continuous chromatographic reactors using dual property based gelular ion exchange resin catalyst
D. Patel and B. Saha, London South Bank University, UK

Liquid-phase alkylation of toluene with 1-hexene over macroreticular ion-exchange resins
M. Cadenas, R. Bingué, C. Fité, M. Iborra, E. Ramírez and F. Cunill, University of Barcelona, Spain

Cleaner and efficient alkenes/terpenes epoxidation process catalysed by novel polymer-supported Mo(VI) complexes
R. Mbeleck, M. L. Mohammed, K. Ambroziak and B. Saha, London South Bank University, UK; D. C. Sherrington, University of Strathclyde, UK

Session A

Environment (1)

Chair: Nalan Kabay

14:00 Removal characteristics of M⁺-exchanged acid clay (M = Li, Na and K) for toxic matter

S. Jun, M. Miyake, Y. Kameshima and S. Nishimoto, Okayama University, Japan

14:30 New sulfonated microcapsules containing DEHPA for the selective removal of heavy metals

Á. Alcázar, A. de Lucas, M. Carmona and J. F. Rodriguez, University of Castilla La Mancha, Spain

15:00 Selection of the matrix and functional group of the ion exchange resin in order to obtain struvite under supersaturation conditions

M. A. Celaya, M. Ortueta, D. Muraviev and F. Mijangos, University of the Basque Country, Spain

15:30 Refreshments

Environment (2)

Chair: Kevin Blaxall

16:00 Recycle use of hybrid process coupling ion exchange with ultrafiltration for boron removal from geothermal water

N. Kabay, D. Yapici, P. Koseoglu and U. Yuksel, Ege University, Turkey

16:30 Development and characterisation of gel and gel bead with SO₃H groups for the removal of Cu(II), Ni(II), Zn(II) and Fe(II) from metal-coating wastewater

S. Cavus, G. Yaşar, Y. Kaya, Z. Beril Gonder, I. Vergili and G. Gürdag, Istanbul University, Turkey

17:00 The extraction of mercury using a polymer inclusion membrane containing Aliquat 336

J. M. Perera, P. Mornane, R. W. Cattrall and S. D. Kolev, University of Melbourne, Australia

17:30 Poster session

19:00 Gala dinner at Gonville and Caius College (please confirm attendance in advance)

Session B

Fundamentals (1)

Chair: Gary Foutch

Separation of electrolytes and organic solutes on elastic ion exchange resins: modelling approaches

J. Heinonen, M. Laatikainen and T. Sainio, Lappeenranta University of Technology, Finland

Hydration of ion exchangers: thermodynamics and quantum chemistry calculations

V. Soldatov, Institute of Physical Organic Chemistry of NAS, Belarus and Lublin University, Poland; S. Pristavko and V. Zelenkovskii, Institute of Physical Organic Chemistry of NAS, Belarus

Prediction of ion exchange equilibria with respect to temperature for a ternary system of Na⁺-Ca²⁺-Mg²⁺ ions

M. Rustam and D. C. Shallcross, University of Melbourne, Australia

Fundamentals (2)

Chair: Vladimir Soldatov

Swelling of resins and sorbents in liquids and vapours: thermodynamic paradoxes

V. A. Davankov and A. V. Pastukhov, Russian Academy of Sciences, Russia

Investigation of the mass transfer process in the metal ion exchanger nanocomposites

T. Kravchenko, L. Polyanskiy, S. Khorolskaya and A. Kalinichev, Voronezh University, Russia

The main role of the hydrogen bond in the ion transport processes of the cation exchangers

L.S. Nechaeva, E.V. Butyrskaya, V.A. Shaposhnik, Voronezh University, Russia

Friday 21 September

Session A

Novel extractants (1)

Chair: Arup Sengupta

09:00 Bifunctional ion exchangers: surface modification of ion exchange materials with metal nanoparticles

D. N. Muraviev, A. Alonso, J. Bastos-Arrieta, M. Muñoz and J. Macanas, Autonomous University of Barcelona, Spain

09:30 Bipolar nano-surface for high-performance ion-exchange separation

A. Dolgonosov, R. Khamizov and N. Koltolina, Vernadsky Institute, Russia

10:00 Sulfonated carbon nanofibre fabrics for high capacity ion-exchanger: size effect on surface area, ion-exchange and adsorption capacities

H. Matsumoto, S. Imaizumi, M. Minagawa and A. Tanioka, Tokyo Institute of Technology, Japan

10:30 Anion-exchange reaction of carbonate layered double hydroxide in non-aqueous system

T. Tanaka, Y. Kameshima, S. Nishimoto and M. Miyake, Okayama University, Japan

11:00 Refreshments

Novel extractants (2)

Chair: Michael Cox

11:30 Selective separation of molybdenum by highly functional xerogels enclosing LIX63 extractant

S. Susa, T. Sugimori, S. M. Rana, H. Mimura and Y. Niibori, Tohoku University, Japan

12:00 Adsorption properties of lanthanoids for SiO₂-P adsorbents impregnated with extractants

K. Yamanishi, H. Mimura, Y. Sasaki, Y. Morita, Tohoku University, Japan

Session B

Biofuel

Chair: Klaus-Dieter Topp

Ion exchange resins catalysed esterification of free fatty acids in used cooking oil with methanol: an efficient pre-treatment method for biodiesel production

B. Saha, London South Bank University, UK; S. Zainal Abidin and K. F. Haigh, Loughborough University, UK

New microporous polystyrene sulfonic acid catalyst for free fatty acid esterification

D.R. Brown and E. Andrijanto, University of Huddersfield, UK

The role of ion exchange and adsorption on aqueous and organic glycerol phase purification

M. Carmona, Á. Alcázar, Á. Pérez and J. F. Rodríguez, University of Castilla La Mancha, Spain

Optimisation of recycling chromatography for biomass hydrolysate fractionation using ion exchange resins

S. Hellstén and T. Sainio, Lappeenranta University of Technology, Finland

Adsorbents

Chair: tba

Adsorptive recovery of some precious metals by using microalgal waste after extracting biofuel

K. Khunathai, K. Inoue, H. Kawakita, K. Ohto, Saga University, Japan; M. Kurata and K. Atsumi, DENSO Corporation, Japan; S. Alam, Memorial University, Canada

Adsorptivity of irradiated polyvinyl-pyrrolidone to metal ions

M. Nogami and N. Miyata, Kinki University, Japan; N. Sato, Kyoto University, Japan

Session A

12:30 Selective adsorption and recovery of Au(III) by alginate gel polymer microcapsules enclosing TOA extractant
S. M. Rana, Tohoku University, Japan

13:00 Award of prizes

13:15 Lunch and close

Session B

Polystyrene-type matrices with ultimate crosslinking densities
M. P. Tsyurupa, Z. K. Blinnikova, V. A. Davankov, Russian Academy of Sciences, Russia

Poster presentations

Adsorbents

Adsorptive removal of fluoride from water by using orange waste gel loaded with tetravalent zirconium or cerium ions
H. Paudyal, B. Pangen, K. Inoue, H. Kawakita and K. Ohto, Saga University, Japan and S. Alam, Memorial University, Canada

Anionic adsorption onto biomass derived activated carbon
D. Duranoğlu, C. Bakkal and U. Beker, Yıldız Technical University, Turkey

Biofuels

Purification by ion exchange of acarbose and other nitrogen organo-compounds from biological sources
J. F. Rodriguez, A. Alcazar, A. de Lucas and M. Carmona, University of Castilla La Mancha, Spain

Environment

Evaluation of iron based hybrid materials for heavy metal ions
Z. Hubicki, M. Kowalczyk and D. Kołodzyńska, Maria Curie Skłodowska University, Poland

Synthesis of gel and gel bead with –COOH group: characterization and application for a battery wastewater
I. Vergili, Z. Beril Gonder, Y. Kay, S. Cavus and G. Gürdag, Istanbul University, Turkey

Complexing agents of a new generation and their application in heavy metal ions removal from different waste waters
D. Kołodzyńska, Maria Curie Skłodowska University, Poland

Kinetics, equilibrium and breakthrough studies for multicomponent removal of Cu(II), Ni(II), Zn (II) using a strong acidic ion exchanger
Y. Kaya, S. Cavus, Z. Beril Gonder, I. Vergili and G. Gürdag, Istanbul University, Turkey

Removal of emerging contaminants from aqueous solutions by using polymeric resins
D. Liu and G. Thundercliffe, The Purolite Company, USA

Removal of boron and fluoride from waste water including boric acid, fluoride ion and tetrafluoroborate ion
E. Yoshikawa, A. Sasaki and M. Endo, Yamagata University, Japan

Ion exchange of lead(II) from aqueous solution onto modified wood sawdust
R. Leyva-Ramos, J. J. Salazar-Rabago, J. Mendoza-Barron, R. M. Guerrero-Coronado and P. Coronado-Oyarvide, Universidad Autonoma de San Luis Potosi, Mexico

Removal of As(V) from aqueous solution by activated carbon-based hybrid adsorbent

U. Beker, A. Ozge, A. Tuna and D. Duranoglu, Yildiz Technical University, Turkey

Fundamentals**Changes in ion exchange resin mass transfer coefficients with age**

M. Hasan, E. Walker, and G. L. Foutch, Oklahoma State University, USA

Predicting bead rise during cation and anion resin separation

S. Kulkarni and G. L. Foutch, Oklahoma State University, USA

Mixed-bed ion exchange performance for sodium removal with incomplete regeneration of cation resin

J. Lee and G. L. Foutch, Oklahoma State University, USA

Mass transfer kinetics modeling in bifunctional ion exchangers with chemical reactions on active centres

A. Kalinichev, Russian Academy of Sciences, Russia

Zn(II) sorption behaviour from aqueous solutions onto polymeric microcapsules containing an alkylphosphonic compound

F. Valenzuela, C. Basualto, J. Sapag and C. Araneda, Universidad de Chile, Chile

Hydrometallurgy**Separation of rare earth metals from phosphor materials**

A. Kawasaki, S. Nishihama, and K. Yoshizuka, University of Kitakyushu, Japan

Selective recovery of lithium and cobalt from spent lithium ion battery using integrated ion exchange methods

K. Yoshizuka, K. Hayashida and S. Nishihama, University of Kitakyushu, Japan

Study of uranium sorption from industrial solutions by anionites

O. V. Petrakova, V. Y. Korovin and A. S. Olifirenko, Syntez Science Innovation Company (NVK "Syntez") Ltd., Russia

Scrubbing of co-loaded calcium from base metal-loaded iminodiacetic acid resin

V. Yahorava and M. H. Kotze, Mintek South Africa

Novel Exchangers**Selective adsorption of palladium by novel xerogels enclosing insoluble copper ferrocyanides**

H. Mimura, T. Kuzumaki and Y. Niibori, Tohoku University, Japan; T. Ohnishi and S-I Koyama, Japan Atomic Energy Agency, Japan

Separation of ionic mixtures in sorption columns with two liquid phases

R. Kh. Khamizov, A. N. Krachak A.N, Vernadsky Institute of Russian Academy of Sciences, Russia; S. Kh. Khamizov, Scientific and Technological Company, "New Chemistry", Ltd, Russia

Spectrophotometry investigation of palladium and silver nanoparticles: incorporation into perfluorosulfonated cationic membrane MF-4SK

A. Revina, S. Busev, A. Kalinichev and M. Kuznetsov, Frumkin Institute of Physical Chemistry and Electrochemistry, Moscow, Russia

Nuclear Applications

Second generation ion exchange filter disks

P. A. Yarnell, Graver Technologies, USA

Approaches for cesium uptake by vermiculite

N. Suzuki, S. Ozawa, K. Ochi and T. Chikuma, Showa Pharmaceutical University, Japan;
Y. Watanabe, Kanazawa Institute of Technology, Japan

The performance of palladium doped resin for stator water oxygen control during trials conducted by EDF Energy plc

C. Atkinson, EDF Energy plc, UK

Water Treatment

Recovery of lithium from geothermal water by ion exchange-membrane filtration hybrid method

N. Kabay, S. G. Ilarslan, M. Arda and U. Yuksel, Ege University, Turkey; S. Nishihama and K. Yoshizuka, University of Kitakyushu, Japan

Valorization of seawater reverse osmosis desalination brines: nanofiltration as purification technology for polyvalent ions removal

S. Casas, UPC-Barcelona TECH Spain; J. L. Cortina, UPC-Barcelona TECH and CETAQUA, Spain; C. Aladjem, SOLVAY, Spain; E. Larrotcha and J. I. Barios, CETAQUA, Spain

Effect of conditioning on the proton transport through perfluorinated polymeric membranes

A. Barrio, A. Celaya, M. Uresandi and F. Mijangos, University of the Basque Country, Spain

Technical Training Courses

Three technical training courses are associated with this conference.

Introduction to Ion Exchange for Industrial Water Treatment: Plant specification and troubleshooting

17 - 18 September 2012, Queens' College, Cambridge, UK

Advanced Ion Exchange for Industrial Water Treatment: Plant design and troubleshooting

17 - 18 September 2012, Queens' College, Cambridge, UK

Ion Exchange Theory and Practice for Bioprocessing

18 September 2012, Queens' College, Cambridge, UK

For more information about any of these courses, or to book, please go to -

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Bursaries

A limited number of bursaries are being offered to students and young researchers who are presenting papers to cover the registration fee and accommodation at Queens' College for two nights. To apply for a bursary, please send an email with "IEX bursary application" in the title to - conferences@soci.org

Prizes

Prizes will be awarded to the best presentations by students.

Exhibition

An exhibition will run alongside the conference for companies and related organisations who may wish to exhibit. For further information and prices please send an email to patricia.cornell@soci.org

Venue

As previous attendees of the IEX Conferences will know Cambridge is a delightful small city with a long history being founded in the first century which still retains the atmosphere of a country market town although it is a centre for many high technology industries. The city has much to offer the visitor including beautiful colleges and churches, famous museums and art galleries and numerous open spaces. On this occasion the Conference will be held at Queens' College which is located in the centre of the city.

A map will be sent to all delegates with the confirmation email

Accommodation

Accommodation for delegates at the college comprises of single study en-suite bedrooms. Rooms will be allocated on a first come first served basis.

The accommodation package is for 2 nights: Wednesday 19 and Thursday 20 September. This includes Full English or Continental breakfast, an evening meal on Wednesday and the Gala dinner on Thursday 20 September.

Accommodation can also be booked for Tuesday night, including an evening meal on Tuesday and breakfast on Wednesday.

Bedrooms at the college will be available from 14.00 on the day of arrival and must be vacated by 10.00am on the day of departure.

All rooms have internet connection, and luggage storage will be available. Those not wishing to stay in college accommodation can book accommodation directly through www.visitcambridge.org

Dinners

Delegates staying at the College have their evening meals included. Non-resident delegates can book the evening meals separately using the form overleaf or on-line. The Gala Dinner on Thursday 20 September will take place at Gonville and Caius College, a short walk from Queens' College and is included for all delegates. Please confirm your attendance.

Travel

Travel to Cambridge is convenient by road or rail. Queens' College is on Silver Street, off Trumpington Street, close to the city centre.

There are frequent train services to Cambridge from London King's Cross and Liverpool Street Stations. The nearest international airport is London Stansted (30 miles) which has rail and coach links to Cambridge. From London Heathrow and Gatwick Airports there are express rail links to central London for onward rail journeys as above. There are also coach links from both airports direct to Cambridge.

Please note there is no on-site car parking at the College. A limited number of parking spaces are available at the University Sports Ground, about 20 minutes walk away for £3.50 per day. Please inform us in advance if you intend to bring your car.

Organising Committee

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Mr Jean Moriau, Lanxess
Ms Sarah Price, EDF Energy plc
Dr Rob Terrell, ABB Consulting
Prof K Clive Thompson, Alcontrol Labs
Dr Sharon Williams, Prometic Biosciences
Mr Brian Windsor, Purolite International Ltd

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IEX 2012

19 - 21 September 2012 @ Queens' College, Cambridge, UK

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Tuesday 18 September.....£110

Wednesday 19 & Thursday 20 September.....£220

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