

Technical and Social Programme

3-7 October 2011

Sheraton Hotel & Convention Center, Santiago, Chile

Sunday, 2 October – Monday, 3 October

8:30-18:00 Two-day short course: **Solvent extraction of Cu, Zn, Ni, Co and U – flowsheet development and plant problems.**

Instructors: Dr. Gary Kordosky, Mr. Peter Cole, Dr. Gordon Ritcey and Dr. Kathy C. Sole, San Cristóbal Lecture Hall A

Monday, 3 October

15:00-19:00 **Conference Registration**, Convention Center Foyer

18:00-18:30 **Author and Session Chair Coordination Meeting**, San Cristóbal Lecture Hall A

19:00-20:00 **Inauguration Ceremony**, San Cristóbal Lecture Halls B & C

Words of Welcome: Eng. Carlos Barahona, ISEC 2011 Executive Director, Gecamin, Chile

Technical Overview: Prof. Dr. Fernando Valenzuela L., ISEC 2011 Technical Coordinator,
Head Professor, Universidad de Chile, Chile

Opening Address: Dr. Jorge Menacho, ISEC 2011 Chair, General Manager, De Re Metálica, Chile

Keynote Lecture: **Solvent extraction—where to from here**, Prof. Dr. Geoff W. Stevens,
Chairman of International Committee on Solvent Extraction, The University of Melbourne, Australia

20:00-22:00 **Welcome Reception**, Foyer

Tuesday, 4 October

08:20-08:30 **Programme Presentation and News Update**, Fernando Valenzuela, Technical Coordinator

PLENARY SESSION 1 Chair: **Boelo Shuur**, San Cristóbal Lecture Halls B & C

08:30-09:15 **An alternative formulation for SX industrial operations concerned with nitration**
Héctor Yáñez, Alexis Soto, Osvaldo Castro and Mauricio Morales, Cytec Industries, Chile; Matthew Soderstrom, Cytec Industries, USA

09:15-10:00 **Sharing five years of pilot plant experience on aromatics extraction with ionic liquids**
Ferdy Onink, Antje Hansmeier, Wytze Meindersma and André de Haan, Department of Chemical Engineering, Eindhoven University of Technology, The Netherlands

10:00-10:40 **COFFEE BREAK / POSTER PRESENTATIONS**
Foyer and O'Higgins Lecture Hall

SESSION 1: Fundamentals, San Cristóbal Lecture Hall A

Chair: **Keith R. Barnard & Simon Assmann**

10:40 **Theoretical and experimental investigation of droplet-droplet coalescence phenomena**
Arijit A. Ganguli and Eugeny Y. Kenig, Fluid Process Engineering, University of Paderborn, Germany; René T. Eiswirth and Hans-Jörg Bart, Separation Science and Technology, University of Kaiserslautern, Germany

SESSION 2: Biotechnology, pharmaceuticals, life science products and organic products, San Cristóbal Lecture Hall B

Chair: **André de Haan & Fernando Valenzuela L.**

10:40 **Renewable glycolaldehyde isolation from pyrolysis oil by reactive extraction with primary amines**
Caecilia R. Vitasari, Geert W. Meindersma and André de Haan, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, The Netherlands

SESSION 3: Nuclear fuel reprocessing, San Cristóbal Lecture Hall C

Chair: **Bruce A. Moyer & Dominique M. Warin**

10:40 **Progress of extraction process in future nuclear fuel cycles**
Dominique M. Warin, Christophe Poinssot, Pascal Baron and Marie-Christine Charbonnel, Process and Radiochemistry Department, Nuclear Energy Direction, CEA Atomic Energy and Alternative Energies Agency-Marcoule, France

11:00 **Prediction of sedimentation and coalescence profiles for copper extractants**

11:00 **Extraction of butanol from aqueous solutions and fermentation broth using**

11:00 **Recycling of used nuclear fuel—bringing well-established solvent extraction**

	Jonathan Castillo, Felipe Biela and Patricio Navarro, Department of Metallurgical Engineering, School of Engineering, Universidad de Santiago de Chile, Chile	ionic liquids Francesca Santangelo, Martin Stoffers and Andrzej Górak, Laboratory of Fluid Separations, Department of Biochemical and Chemical Engineering, TU Dortmund University, Germany; William Pitner and Michael Schulte, Merck KGaA, Germany	processes into the 21st century Chris Phillips and Stuart Arm, Applied Technology, EnergySolutions, USA
11:20	Effect of modifiers on the interfacial tension of P50 at the heptane-water interface Wendy Tao, Sarah Glasson, Geoff W. Stevens and Jilka M. Perera , Particulate Fluids Processing Centre, The University of Melbourne, Australia	11:20 Magnetic composite particles for the separation of naphthenic acid from organic solvents Zatoun Akhtar, E. Susana Pérez de Ortiz , Julian Waters and David Chadwick, Department of Chemical Engineering, Imperial College London, UK	11:20 Solvent extraction research and development in the US fuel cycle programme Terry A. Todd , Idaho National Laboratory, USA
11:40	Influence of solids (crud) on the separation of liquid two-phase systems Sebastian Ruckes and Andreas Pfennig, AVT-Thermal Process Engineering, RWTH Aachen University, Germany	11:40 Thermodynamic study of chloroquine extraction by organo-phosphorus and thiophosphorus acids Michèle Grosber-Manon, Moncef Stambouli and Dominique Pareau, Process Engineering Lab, Ecole Centrale Paris, France; Jean-Michel Gillet, SPMS Laboratory Ecole Central Paris, France; Jean-Louis Grossiord, Pharmaceutical Physics Laboratory, Université Paris-Sud, France	11:40A powerful tool to model and simulate solvent extraction operations Christian Sorel, Marc Montuir , Coralie Balaguer, Pascal Baron, Binh Dinh, Xavier Hérés, Vincent Pacary and Hervé Roussel, CEA Marcoule, Nuclear Energy Division, Radiochemistry & Processes Department, DEN/DRCP/SCPS, France
12:00	Modelling of extraction equilibria—uranyl nitrate extracted by tributyl-phosphate Stephan Hlushak, Laboratoire PESCA, Université Pierre et Marie Curie, France & Institute for Condensed Matter Physics, Ukraine; Jean-Pierre Simonin , Laboratoire PESCA, Université Pierre et Marie Curie, France; Philippe Moisy and Christian Sorel, CEA Marcoule, France	12:00 Plant-material extraction in a standardised laboratory apparatus using optimal experimental design Dirk Delinksi, Jan Bernd Bol and Andreas Pfennig, AVT-Thermal Process Engineering, RWTH Aachen University, Germany	12:00 Exchange of TBP for a monoamide extraction ligand in a GANEX solvent—advantages and disadvantages Emma Aneheim , Christian Ekberg and Nathalie Mabile, Department of Chemical and Biological Engineering, Nuclear Chemistry, Industrial Materials Recycling, Chalmers University of Technology, Sweden
12:20	Outer-sphere ligands as chlorozincate extractants Jennifer R. Turkington , Philip J. Bailey, Jy Chartres, Ross J. Ellis, David K. Henderson and	12:20	12:20 Direct actinide(III) separation from PUREX raffinate using a BTBP/TODGA solvent Andreas Wilden , Michal Sypula and Guiseppe

Peter A. Tasker, University of Edinburgh, UK;
Eduardo Kamenetzky and Thomas Sassi, Cytec
Industries, USA; Kathryn C. Sole, Independent
Consultant, South Africa

Modolo, Forschungszentrum Jülich GmbH,
Institute of Energy and Climate Research –
Nuclear Waste Management, Germany;
Andreas Geist, Karlsruhe Institute of
Technology, INE, Germany

12:40-14:00 **LUNCH**

Pedro de Valdivia Lecture Halls A, B & C (lower level)

**SESSION 4: Fundamentals, San Cristóbal Lecture
Hall A**

Chair: Alexander Chagnes & Patricio Navarro

14:00 **Outer sphere interactions in copper
complexes of salicylaldehyde hydrazone
extractants**
Benjamin D. Roach, Tai Lin, Ross S. Forgan, Heiko
Bauer, Patricia Richardson, Fraser J. White and
Peter A. Tasker, School of Chemistry, University
of Edinburgh, UK; John Campbell, Cytec
Industries, USA

**SESSION 5: Biotechnology, pharmaceuticals, life
science products and organic products, San
Cristóbal Lecture Hall B**

Chair: Florin Oprea & Romke Kuyvenhoven

14:00 **Challenges and opportunities for
enantioselective liquid-liquid extraction**
Boelo Schuur and André de Haan, Eindhoven
University of Technology, Process System
Engineering Group, The Netherlands

**SESSION 6: Nuclear fuel reprocessing, San
Cristóbal Lecture Hall C**

Chair: Gregg Lumetta & Bruce A. Moyer

14:00 **Recent advances in centrifugal contactor
designs for nuclear applications**
Jack D. Law, David H. Meikrantz and Troy G.
Garn, Idaho National Laboratory, USA;
Lawrence L. Macaluso, Advance Machine
Designs, USA

14:20 **Optical chiral reactions observed at liquid-
liquid interfaces**
Hitoshi Watarai, Institute for NanoScience
Design, Osaka University, Japan; Shiore
Watanabe and Kimika Matsuura, Department of
Chemistry, Osaka University, Japan

14:20 **Phenylalanine extraction using Adogen 464
by liquid surfactant membranes**
Lorena C. Nascimento, Leandro D.S. Andrade,
Cibele Konzen, Julio C. Balarini, Tânia L.S.
Miranda and Adriane Salum, Chemical
Engineering Department, Universidade Federal
de Minas de Gerais, Brazil

14:20 **Kinetics and stability of separation
systems for spent nuclear fuels by
supported liquid membrane extraction**
Ko Nee and Mikael Nilsson, Department of
Chemical Engineering and Materials Science,
University of California-Irvine, USA

14:40 **Current understanding of LIX 63/Versatic
10 synergistic solvent extraction system
chemistry**
Keith R. Barnard, CSIRO Minerals Down Under
National Research Flagship, Australia

14:40 **Solvent impregnated resins (SIRS) for the
trace removal of aromatic nitrogen-
containing compounds from wastewater
streams**
Jeroen Bokhove, Boelo Schuur and André B. de
Haan, Process Systems Engineering Group,
Eindhoven University of Technology, The
Netherlands

14:40 **Promising method for selective
separation of lanthanide(III) using
synergistic extraction**
Yuko Hasegawa, Sayaka Tamaki and Hirofumi
Yajima, Department of Chemistry, Science
University of Tokyo, Japan; Tohru Kobayashi
and Tsuyoshi Yaita, Japan Atomic Energy
Agency, SRRC, Japan

<p>15:00 X-ray crystal structures of nickel and cobalt alpha-hydroxyoxime-carboxylic acid synergist complexes <u>Keith R. Barnard</u>, CSIRO Minerals Down Under Nations Research Flagship, Australia; Matthew McIldowie, Gareth L. Nealon and Mark I. Ogden, Department of Chemistry, Curtin University, Australia; Brian W. Skelton, School of Biomedical and Chemical Sciences, University of Western Australia, Australia</p>	<p>15:00 Extractant screening for bio-based recovery of carboxylic acids <u>Agnieszka Krzyzaniak</u>, Boelo Schuur and André B. de Haan, Process System Engineering Group, Eindhoven University of Technology, The Netherlands</p>	<p>15:00 Impact of sulphate media on the extraction of rare earths with organophosphorous reagents Marina Fainerman-Melnikova, Elizabeth Ho and <u>Karin Soldenhoff</u>, ANSTO Minerals, Australian Nuclear Science & Technology Organisation, Australia</p>
<p>15:20 Solvent impregnated kapok fibre for separation of rare earth metals <u>Syouhei Nishihama</u>, Natsuki Higa, Kazuharu Yoshizuka, Department of Chemical Engineering, The University of Kitakyushu, Japan</p>	<p>15:20 The influence of polymer addition in a microemulsion system and its application in enhanced oil recovery <u>Tereza N.C. Dantas</u>, Ewerton R.F. Teixeira, Cátia G.F. Teixeira and Rangel R.R. Teixeira, Chemistry Department, Universidade Federal do Rio Grande do Norte, Brazil; Afonso A.D. Neto, Chemical Engineering Department, Universidade Federal do Rio Grande do Norte, Brazil</p>	<p>15:20 Radiolytic stability of TODGA—characterisation and quantification of degradation compounds Ana Núñez and <u>Hitos Galán</u>, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Spain; Aritz Durana, Institute of Chemical Research of Catalonia (ICIQ), Spain; Rosa Sedano, SIDI Universidad Autónoma de Madrid (UAM), Spain; Javier de Mendoza, Institute of Chemical Research of Catalonia (ICIQ), Spain; Amparo G. Espartero, Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Spain</p>
<p>15:40 Palladium extraction from acidic chloride streams using simple oxime ligands <u>A. Matthew Wilson</u>, David K. Henderson, Jason B. Love, Peter A. Tasker, Sarah Belair, Richard Grant, UNIVERSITY OF EDINBURGH, School of Chemistry, UNIVERSITY OF EDINBURGH, School of Chemistry, UK</p>	<p>15:40 Separation and purification of organic acids using membrane contactors <u>Luciana de S. Moraes</u>, Helen C. Ferraz and Alberto C. Habert, Chemical Engineering Program PEQ/COPPE, Federal University of Rio de Janeiro, Brazil</p>	<p>15:40 Radiolytic stability of nuclear reprocessing extraction ligands <u>Stephen P. Mezyk</u>, Department of Chemistry and Biochemistry, California State University at Long Beach, USA; Bruce Mincher, Aqueous Separations and Radiochemistry Department, Idaho National Laboratory, USA</p>

16:00-16:20 **COFFEE BREAK / POSTER PRESENTATIONS**
Foyer and O'Higgins Lecture Hall

SESSION 7: Fundamentals, San Cristóbal Lecture Hall A

Chair: Hitoshi Watarai & Andreas Pfennig

SESSION 8: Industrial practices, San Cristóbal Lecture Hall B

Chair: Gary Kordosky & Peter Haig

SESSION 9: Nuclear fuel reprocessing, San Cristóbal Lecture Hall C

Chair: Chris Phillips & Gunzo Uchiyama

16:20 **Effect of pulsed electrostatic fields on mass transfer in a modified Lewis cell**

Simon Assmann and Don C. Ibanez, Department of Metallurgical & Minerals Engineering, WA School of Mines, Curtin University, Australia; Christopher McRae, Department of Chemistry & Biomolecular Sciences, Macquarie University, Australia

16:20 **Organic cleaning with centrifuge technology**

Christian Neira & Tore Hartmann, Mechanical Separation, GEA Westfalia Separator, Chile

16:20 **Monitoring and modelling of radiolytic degradation products of TBP/*n*-dodecane**

James M. Peterson, Tatiana G. Levitskaia and Samuel A. Bryan, Separations & Radiochemistry Group, Pacific Northwest Laboratory, USA

16:40 **A new vibrational Lewis cell devoted to interfacial chemical kinetics studies**

Moncef Stambouli, Dominique Pareau and Hervé Duval, Engineering Process & Materials Lab, Ecole Centrale Paris, France; Alevtina Ivanova and Viktor Kozlov, Experimental Physics Department, Perm State Pedagogical University, Russia

16:40 **Integrating series and series-parallel circuit configurations for optimum plant performance**

Sidney J. Archer, DRA Mineral Projects, South Africa; Angus Feather, Cognis Ireland—part of BASF, Ireland

16:40 **Physiochemical properties of tributyl phosphate/dodecane/nitric acid systems**

Amber D. Wright, Allen Janezcko and Patricia Paviet-Hartmann, Radiochemistry Department, University of Nevada, USA

17:00 **A kinetic study of gold stripping by oxalic acid in a modified Lewis cell**

Sepideh Javanshir and Mahmoud Abdollahi, Mineral Processing Department, Tarbiat Modares University, Iran; M. Rosinda C. Ismael, M. Teresa A. Reis and Jorge M.R. Carvalho, Centre for Chemical Processes, Instituto Superior Técnico, Technical University of Lisbon, Portugal

17:00 **The potentiality of rare earth recovery using ZINCEX™ technology**

Gustavo Díaz N., Proprietary Technology Development Division, Técnicas Reunidas, Spain; Daniel Martín S.L., Francisco Sánchez R. and Sergio Sanguilinda S., Hydrometallurgy and Electrochemistry, Técnicas Reunidas, Spain

17:00 **Soft donor extractants vs aqueous complexants in trivalent lanthanide/actinide separations**

Kenneth L. Nash, Cecile Marie, Mark D. Ogden and Derek Brigham, Chemistry Department, Washington State University, USA

17:20	Complexation of Ln(III) with the hydrophobic agent TEDGA—structural and thermodynamic studies <u>Marie-Christine Charbonnel</u> , Claude Berthon, Laurence Berthon, Nathalie Boubals, Fabien Burdet, Philippe Guilbaud, Nicole Zorz, Nathalie Mabilie and Sébastien Petit, Nuclear Energy Division, Radiochemistry & Processes Department, Chemistry of Separation Processes Service, Laboratory of Interactions Ligand-Actinides, Commissariat à l'Énergie Atomique, France	17:20	The Spence copper SX plant—an innovative design configuration <u>Rodrigo Hernández</u> , Fernando Pino, Jaime Roco and Pablo Amigo, Jacobs, Chile; Paul E. Thompsen, Jacobs, USA; Mario Ferrera, Minera Escondida, Chile	17:20-	C5-BPP—a new highly selective extractant for the separation of trivalent actinides from lanthanides Andreas Geist and Udo Müllich, Karlsruhe Institute of Technology, INE, Germany; <u>Andreas Wilden</u> , Steve Gülland and Giuseppe Modolo, Forschungszentrum Jülich GmbH, Institute of Energy and Climate Research-Nuclear Waste Management, Germany
17:40	Process intensification in liquid-liquid extraction—changing the solvent and hybrid process <u>Jörg Koch</u> , Juan Herguijuela and Eva Maus, Sulzer Chemtech, Switzerland	17:40	Comparison of low aromatic and traditional hydrocarbon extraction diluents in copper production <u>Marco A. Calzada</u> , ExxonMobil Chemical, Mexico; Ralph Kowalik, ExxonMobil Chemical, USA; Pierre Yves Guyomar, ExxonMobil Chemical, France	17:40	

Wednesday, 5 October

08:20-08:30 **Programme Presentation and News Update**, Fernando Valenzuela, Technical Coordinator

PLENARY SESSION 2 Chair: **Geoff W. Stevens**, San Cristóbal Lecture Halls B & C

08:30-09:15 **Metallurgical performance and characteristics of small and medium size copper SX plants in Chile**
Hans Hein, International Consultant, Chile; Philippe Joly, Cognis Chile—a BASF Company, Chile

09:15-10:00 **Application of solvent extraction to the electroless nickel plating industry—nickel recovery from the spent baths and the bath life extension**
Mikiya Tanaka and Hirokazu Narita, Research Institute for Environmental Management Technology, National Institute of Advanced Industrial Science and Technology (AIST), Japan

10:00-10:40 **COFFEE BREAK / POSTER PRESENTATIONS**
Foyer and O'Higgins Lecture Hall

SESSION 10: Fundamentals / Novel reagents, materials and techniques, San Cristóbal Lecture Hall A

Chair: **Moncef Stambouli & Eduardo Rodríguez de San Miguel**

SESSION 11: Industrial practices, San Cristóbal Lecture Hall B

Chair: **Rodrigo Hernández & David Dreisinger**

SESSION 12: Nuclear fuel reprocessing, San Cristóbal Lecture Hall C

Chair: **Giuseppe Modolo & Terry Todd**

10:40 **Dimerisation, oligomerisation and chemical activities in the organic phase for acidic phosphoric acid reagents in aliphatic diluents**
Michael F. Gray and Mikael Nilsson, Department of Chemical Engineering and Materials Science, University of California-Irvine, USA; Peter R. Zalupski, Aqueous Separations and Radiochemistry Department, Idaho National Laboratory, USA

10:40 **Hatch customised solvent extraction technology**
Scott Poulter, Non-Ferrous, Hatch Associates, Australia; Eduardo Robles, Hydrometallurgy, Hatch Associates, Chile; Chris Panaou and Ken Gottlieb, Hatch Associates, Australia

10:40 **Solvent effects on the extraction rate in proposed GANEX processes**
Elin Löfström-Engdahl, Emma Aneheim, Christian Ekberg, Nathalie Mabile and Gunnar Skarnemark, Industrial Materials Recycling and Nuclear Chemistry, Chalmers University of Technology, Sweden

11:00	<p>Synthesis of semiconductor ZnO and ZnS nanoparticles in a two-phase liquid-liquid system using Cyanex 272 and D2EHPA as extractants Jocabeth Aguilera, Rosa L. Tovar, Adriana Gaona, Octavio Domínguez and <u>Guadalupe Sánchez</u>, Universidad Autónoma de San Luis Potosí, Mexico</p>	11:00	<p>The optimisation of the CSIRO's DSX solvent extraction technology for separation of cobalt and zinc from manganese in the Boleo circuit <u>David Dreisinger</u>, Thomas Glück and Kyle Marte, Baja Mining Corp., Canada; Feng Xie, Materials Engineering, University of British Columbia, Canada</p>	11:00	<p>Speciation of americium(III) and europium(III) with aminopoly-carboxylic acids in DIAMEX-SANEX process <u>Manuel Miguiditchian</u>, Olivia Pecheur, Laurence Berthon and Laurent Couston, Radiochemistry & Processes Department, Commissariat à l'Énergie Atomique-Marcoule, France</p>
11:20	<p>Molecular modelling for designing new extractants in hydrometallurgy <u>Alexandre Chagnes</u>, ENSCP—Chimie ParisTech, France; Bruno Courtaud, Jacques Thiry, AREVA NC, Service d'Études de Procédés et Analyses (SEPA), France; Gérard Cote, ENSCP—Chimie ParisTech, France</p>	11:20	<p>Production of high-concentration nickel from mixed hydroxide products using LIX 84-INS technology Gary A. Kordosky, Independent Consultant, USA; <u>Angus Feather</u>, Cognis Ireland—part of BASF, Ireland</p>	11:20	<p>Actinide(III)/lanthanide(III) separation via selective aqueous complexation of actinides(III) in nitric acid <u>Andreas Geist</u> and Udo Müllich, Karlsruhe Institut für Technologie, INE, Germany; Giuseppe Modolo and Andreas Wilden, Forschungszentrum Jülich, IEF-6, Germany</p>
11:40	<p>Non-dispersive solvent extraction of copper from ammoniacal medium with LIX 54 <u>M. Lurdes F. Gameiro</u>, M. Rosinda C. Ismael, M. Teresa A. Reis and Jorge M.R. Carvalho, Centre for Chemical Processes, Instituto Superior Técnico, Portugal</p>	11:40	<p>Contamination management in solvent extraction plants <u>Graeme Miller</u>, Miller Metallurgical Services, Australia</p>	11:40	<p>Aqueous complexation and interactions of trivalent neodymium with citric acid at varying ionic strengths <u>M. Alex Brown</u>, Department of Chemistry, Oregon State University, USA; Alena Paulenova, Department of Nuclear Engineering and Radiation Health Physics, Oregon State University, USA; Artem V. Gelis, Chemical Sciences and Technology Division, Argonne National Laboratory, USA</p>
12:00	<p>Multifunctional schiff base ligands for UO_2^{2+} binding and extraction Harold B. Tanh Jeazet, Kerstin Gloe, Thomas Doert, Jens Mizera, Axel Heine, Olga N. Kataeva, Margret Acker and <u>Karsten Gloe</u>, Department of Chemistry and Food Chemistry, Technical University Dresden, Germany; Satoru Tsushima and Gert Bernhard, Institute of Radiochemistry, Helmholtz Centre Dresden-Rossendorf, Germany</p>	12:00	<p>Design optimisation of a Cyanex 272 solvent extraction circuit <u>Cyril Bourget</u>, Cytec Canada, Canada; Matthew Soderstrom, Cytec Industries, USA; Simon Donegan, Independent Consultant, Australia; James Morrison, Independent Consultant, England</p>	12:00	<p>Extraction of actinides, fission products and corrosion products from synthetic high-level liquid waste with DMDOHEMA <u>Gunnar Skarnemark</u>, Sofie Englund, Christian Ekberg, Mikael Nilsson and Arvid Ødegaard-Jensen, Department of Chemical and Biological Engineering, Chalmers University of Technology, Sweden</p>

12:20 **Process intensification of solvent extraction using microfluidics**

John Ralston, Craig Priest, Rossen Sedev, Jingfang Zhou and Luke Parkinson, Ian Wark Research Institute, University of South Australia, Australia; Takehiko Kitamori and Kazuma Mawatari, Department of Applied Chemistry, School of Engineering, The University of Tokio, Japan

12:20 **Copper solvent extraction diluent choice— optimised properties equals optimised plant performance**

Peter A. Haig and Andrew M. Duthie, Shell Chemicals, Australia; Sergio M. Valladares, Shell Chemicals, Chile

12:20 **Combining neutral and acidic extractants for recovering transuranic elements from nuclear fuel**

Gregg J. Lumetta, Doinita Neiner, Sergey I. Sinkov, Jennifer C. Carter and Jenifer C. Braley, Pacific Northwest National Laboratory, USA; Stan L. Latesky, University of the Virgin Islands, U.S. Virgin Islands; Artem V. Gelis, Peter Tkac and George F. Vandegrift, Argonne National Laboratory, USA

12:40-14:00 **LUNCH**
Parque Bohío (garden)

14:00-18:00 **TOURISM**

Activities available for all participants.

Please visit the tourism booth at the conference or visit www.isec2011.com for more information.

Thursday, 6 October

08:20-08:30 **Programme Presentation and News Update**, Fernando Valenzuela, ISEC 2011 Technical Coordinator

PLENARY SESSION 3 Chair: **Patricia Paviet-Hartmann**, San Cristóbal Lecture Halls B & C

08:30-09:15 **Milestones and future directions in the solvent extraction of caesium**
Bruce A. Moyer, Chemical Separations Group, Oak Ridge National Laboratory, USA

09:15-10:00 **Framework for optimal performance of industrial copper solvent extraction plants**
Jorge M. Menacho and Yadranka Zivkovic, De Re Metálica, Chile

10:00-10:40 **COFFEE BREAK / POSTER PRESENTATIONS**
Foyer and O'Higgins Lecture Hall

SESSION 13: Novel reagents, materials and techniques, San Cristóbal Lecture Hall A
Chair: **John Ralson & Inmaculada Ortíz**

SESSION 14: Hydrometallurgy and metals extractions, San Cristóbal Lecture Hall B
Chair: **Tannice McCoy & Cecilia Demergasso**

SESSION 15: Nuclear fuel reprocessing, San Cristóbal Lecture Hall C
Chair: **Marie-Christine Charbonnel & Ken L. Nash**

10:40 **Composite membranes in liquid membrane permeation with support layers**
Marlene Fritz, Hannes Noll and Matthäus Siebenhofer, Department of Chemical Engineering and Environmental Technology, Graz University of Technology, Austria

10:40 **Gold-thiocyanate solvent extraction with tertiary amine extractants**
Jaeheon Lee and Sevket Acar, Newmont Metallurgical Services, USA; Michael Virnig, Cognis Corporation, USA

10:40 **Speciation in solvent extraction systems containing malonamide and dialkylphosphoric acid**
Julie Muller, Laurence Berthon and Nicole Zorz, CEA, Nuclear Energy Division, Radiochemistry & Processes Department, France; Jean-Pierre Simonin, University Pierre et Marie Curie, France

11:00 **Efficient regeneration of Cr(III) passivation baths using liquid membranes**
Eugenio Bringas, Rosa Mediavilla, Ana M. Urtiaga and Inmaculada Ortiz, Department of Chemical Engineering and Inorganic Chemistry, University of Cantabria, Spain

11:00 **Recovery of zinc from hot-dip galvanising effluent using tri-*n*-butyl phosphate**
Kwan H. Lum, Sandra E. Kentish and Geoff W. Stevens, Department of Chemical and Biomolecular Engineering, The University of Melbourne, Australia

11:00 **Contributing to the discussions on the fundamental aspects and complexities of TALSPEAK chemistry**
Peter R. Zalupski and Leigh R. Martin, Aqueous Separations and Radiochemistry Department, Idaho National Laboratory, USA

<p>11:20 Supercritical fluid extraction of Cu(II) from aqueous solutions using a hollow fibre contactor Rossana Sepúlveda, Hugo Valdés and <u>Julio Romero</u>, Laboratory of Membrane Separation Processes (LabProSeM), Department of Chemical Engineering, Universidad de Santiago de Chile, Chile</p>	<p>11:20 Zinc extraction from high chloride liquors <u>Takalani Gangazhe</u>, Anglo American, South Africa; Kathryn C. Sole, Independent Consultant, South Africa; Jochen Petersen, University of Cape Town, South Africa</p>	<p>11:20 Complex interactions in solvent extraction—biphasic speciation in the TALSPEAK process <u>Kenneth L. Nash</u>, Mikael Nilsson, Travis Grimes, Jenifer Braley, Kazuyoshi Uruga and Cecile Marie, Chemistry Department, Washington State University, USA</p>
<p>11:40 In(III)/Fe(III) separation from nitrate, chloride and sulphate media using SX and SLMs with D2EHPA María Ballinas, Faculty of Chemical Sciences, Universidad Autónoma de Chihuahua, Mexico; <u>Eduardo Rodríguez De San Miguel</u> and Josefina de Gyves, Analytical Chemistry Department, Universidad Nacional Autónoma de México, Mexico</p>	<p>11:40 Zinc extraction from sulphate media with systems based on Cyanex 301 Isaac Yu. Fleitlikh, Gennady L. Pashkov, Natalia A. Grigorieva and Lidia K. Nikiforova, Institute of Chemistry and Chemical Technology, SB RAS, Russia; <u>Olga A. Logutenko</u>, Institute of Solid State Chemistry and Mechanochemistry, SB RAS, Russia</p>	<p>11:40 Investigating the onset of third-phase formation for acidic phosphoric acid reagents Andrew Maycock, Department of Chemical Engineering and Materials Science, University of California—Irvine, USA; George Miller, Department of Chemistry, University of California—Irvine, USA; <u>Mikael Nilsson</u>, Department of Chemical Engineering and Materials Science, University of California—Irvine, USA</p>
<p>12:00 Recovery of Bi(III) by liquid-liquid extraction and supported liquid membranes using Cyphos IL 101 Luisa Zempoaltecat and Luis Santiago, Department of Chemical Engineering and Biotechnology, Universidad Politécnica de Tlaxcala, Mexico; Diana Cholico, Pilar González, Imelda Saucedo, Ricardo Navarro and <u>Mario Ávila-Rodríguez</u>, Department of Chemistry, Universidad de Guanajuato, Mexico</p>	<p>12:00 Recovery of indium from LCD screens <u>Sami Virolainen</u>, Lappeenranta University of Technology, Finland; Erkki Paatero, Lappeenranta University of Technology & Outotec Oyj, Finland; Don C. Ibanez, Curtin University of Technology: Western Australian School of Mines, Australia</p>	<p>12:00 Next-Generation Caustic-Side Solvent Extraction (Ng-Cssx) Process Lætitia H. Delmau, Chemical Sciences Division, Oak Ridge National Laboratory, USA; Joseph F. Birdwell Jr., Fuel Cycle and Isotopes Division, Oak Ridge National Laboratory, USA; Peter V. Bonnesen, Nathan B. Ladd, <u>Bruce A. Moyer</u> and Erica L. Stoner, Chemical Sciences Division, Oak Ridge National Laboratory, USA; Denise L. Lee, Fuel Cycle and Isotopes Division, Oak Ridge National Laboratory, USA; Frederick V. Sloop Jr., Chemical Sciences Division, Oak Ridge National Laboratory, USA</p>
<p>12:20 Liquid membrane permeation with support layers Marlene Fritz, <u>Hannes Noll</u> and Matthäus Siebenhofer, Institute of Chemical Engineering</p>	<p>12:20 Recovery of silver and gold from thiourea leaching ore liquors—design of process flowsheet Zeferino Gamiño-Arroyo, <u>Moncef Stambouli</u> and</p>	

and Environmental Technology, Graz University
of Technology, Austria

Dominique Pareau, Process Engineering and
Materials Lab, Ecole Centrale Paris, France;
Mario Ávila-Rodríguez, Faculty of Chemistry,
Universidad de Guanajuato, Mexico

12:40-14:00 **LUNCH**
Parque Bohío (garden)

**SESSION 16: Novel reagents, materials and
techniques, Lecture Hall San Cristóbal A**

**Chair: Kazuharu Yoshizuka & Fernando
Valenzuela**

14:00 **Solvent extraction of zinc in HCL media
using tributylphosphate (TBP) and liquid
membranes**
M^a Fresnedo San Román, Eugenio Bringas,
Marta Vallejo, Angel Irabien and Inmaculada
Ortiz, Department of Chemical Engineering and
Inorganic Chemistry, Universidad de Cantabria,
Spain

14:20 **Recycling of heavy metal ions in a
continuously operated supported liquid
membrane reactor**
Hannes Noll, Marlene Fritz and Matthäus
Siebenhofer, Technische Universität Graz,
Austria

14:40 **Separation of rare earth metals by a highly
stable liquid membrane composed of ionic
liquids**
Masahiro Goto and Fukiko Kubota, Department
of Applied Chemistry, Kyushu University, Japan

**SESSION 17: Process chemistry and engineering,
San Cristóbal Lecture Hall C**

**Chair: Julio Romero &
Patricia Paviet-Hartmann**

14:00 **Metal separation after selective dissolution
of nickel metal hydride batteries**
Kristian Larsson, Christian Ekberg and Arvid
Ødegaard-Jensen, Industrial Materials Recycling,
Chalmers University of Technology, Sweden

14:20 **Extraction of cobalt(II) and iron(II) from
nickel(II) solutions with nickel salts of
Cyanex 272**
Michiel C. Olivier, Christie Dorfling and Jacques
J. Eksteen, Department of Process Engineering,
University of Stellenbosch, South Africa

14:40 **Separation of Co from Ni in an impure
sulphate solution, part 1—extraction**
Tannice McCoy, Keith Mayhew and David Jones,
Teck Resources, CESL Limited, Canada; Keith R.
Barnard, Wensheng Zhang, Chu Yong Cheng and
Dave J. Robinson, CSIRO Minerals Down Under
National Research Flagship, Australia

**SESSION 18: Hydrometallurgy and metals
extractions, San Cristóbal Lecture Hall B**

Chair: Geoff W. Stevens & Huizhou Liu

14:00 **Performance comparison between KARR
column and pulsed column**
Donald Glatz and Wendy Parker, Koch Modular
Process System, LLC., USA

14:20 **Optimal spacing in BPC disk and
doughnut pulsed columns**
Baruch Grinbaum, Israel Kenner (+), Nadav
Dobrin and Alon Efraim, Bateman Advanced
Technologies, Israel; Geoff W. Stevens,
Chemical and Biomolecular Department, The
University of Melbourne, Australia

14:40 **Hydraulic characteristics, holdup and
flooding of pulsed disk and doughnut
column**
Oded Lerner, Nadav Dobrin and Einat
Shooster, Bateman Advanced Technologies,
Israel

Separation of Co from Ni in an impure sulphate solution, part 2—stripping

Tannice McCoy, Keith Mayhew and David Jones, CESL Limited, Teck Resources, Canada; Keith R. Barnard, Chu Yong Cheng, Dave J. Robinson and Wensheng Zhang, CSIRO Minerals Down Under National Research Flagship, Australia

15:00 **Olefin/paraffin separation using room temperature ionic liquids containing a copper salt**
Daniel Gorri, Juan Canales, Alfredo Ortiz and Inmaculada Ortiz, Department Chemical Engineering and Inorganic Chemistry, Universidad de Cantabria, Spain

15:00 **Separation of ruthenium, iridium and rhodium by solvent extraction using an amide extractant**
Sarah Belair, Barbara Breeze, Richard Grant, Paul O'Shaughnessy and Emma Schofield, Johnson Matthey Technology Centre, UK; Stephen Woollam, Anglo Research, South Africa

15:00 **A new design method for stirred liquid-liquid extraction columns based on single-drop experiments**
Florian Buchbender and Andreas Pfennig, RWTH Aachen University, AVT-Thermal Process Engineering, Germany

15:20 **Mechanisms of metal ion transfer into RTILs—implications for their use as extraction solvents**
Mark L. Dietz, Sarah L. Garvey and Cory A. Hawkins, Department of Chemistry & Biochemistry, University of Wisconsin-Milwaukee, USA

15:20 **Stripping rare earth elements from D2EHPA during zinc solvent extraction**
Estelle Alberts, Skorpion Zinc, Namibia; Christie Dorfling, Department of Process Engineering, Stellenbosch University, South Africa

15:20 **Simulation of a miniplant Kühni extraction column coupled with PBM**
Mark W. Hlawitschka and Hans-Jörg Bart, Centre for Mathematical and Computational Modelling, University of Kaiserslautern, Germany

15:40 **Skorpion Zinc—lessons learnt in the operation of the modified Zincex™ solvent extraction process**
Carlota David and Stefan Engelbrecht, Skorpion Zinc, Namibia; Gustavo Díaz N., Francisco Sánchez R. and Ana Belén Mejias, Técnicas Reunidas, Spain
Presented by Jaime Calvo-Catalán, Técnicas Reunidas, Spain

15:40 **Separation of europium and yttrium from sulphuric liquor of electronic scrap by solvent extraction**
Luciene V. Resende and Carlos A. Morais, Centro de Desenvolvimento da Tecnologia Nuclear, CDTN/CNEN, Brazil

15:40 **Determination of drop sizes in extraction columns by automated optical image analysis**
Matthias Mickler and Hans-Jörg Bart, Technical University of Kaiserslautern, Germany; Stephan Didas, Fraunhofer ITWM, Germany

16:00 **COFFEE BREAK / POSTER PRESENTATIONS**
Foyer and O'Higgins Lecture Hall

SESSION 19: Novel reagents, materials and techniques, Lecture Hall San Cristóbal A

Chair: **Mark L. Dietz & Hannes Noll**

16:20 **Electrochemical aspects of extraction of metal ions in ionic liquid-water two-phase systems**

Ryota Tereoka and Takashi Kakiuchi,
Department of Energy and Hydrocarbon
Chemistry, Kyoto University, Japan

16:40 **Competitive extraction of Fe(III) and Zn(II) using amberlite XAD-7 impregnated with an ionic liquid**

Ricardo Navarro, Imelda Saucedo, Violeta Gallardo, Mario Ávila-Rodríguez and Pilar González, Department of Chemistry, Natural and Exact Sciences Division, Universidad de Guanajuato, Mexico; Eric Guibal, Laboratoire Génie de l'Environnement Industrial, Ecole de Mines Alès, France

17:00 **Synergistic solvent impregnated resin for selective recovery of lithium ion**

Kazuharu Yoshizuka, Kenta Onishi, Takahide Nakamura and Syouhei Nishihama, Department of Chemical Engineering, The University of Kitakyushu, Japan

17:20 **Properties of microcapsules containing PC-88A with connected spherical pores for Zn(II) extraction**

Koichiro Shiomori, Asuka Matsushita and Takashi Sana, Department of Applied Chemistry, University of Miyazaki, Japan; Shiro Kiyoyama,

SESSION 20: Hydrometallurgy and metals extractions, San Cristóbal Lecture Hall B

Chair: **Jörg Koch**

16:20 **Experimental counter-current solvent extraction of uranium and molybdenum from acid leach liquors**

Ana M.G. La Gamma, Elena T. Becquart, Mauricio Chocrón, Valeria Díaz and Arián Avato, Centro Atómico Constituyentes, Comisión Nacional de Energía Atómica, Argentina

16:40 **Recovery of molybdenum from copper leach solutions by solvent extraction**

Violina Cocalia, Troy Bednarski, Douglas J. Harris, Héctor Yáñez, Alexis Soto, Matthew Soderstrom and Eduardo Kamenetzky, Cytec Industries, USA

17:00 **Mechanism of rhenium extraction with TBP in presence of sulphuric acid**

Davoud F. Haghshenas, Dariush Darvishi, Eskandar K. Alamdari and Ali H. Eivazi, Department of Mining and Metallurgical Engineering, Amirkabir University of Technology, Iran; Seyed K. Sadrnezhad, Department of Materials Engineering and Science, Sharif University of Technology, Iran

17:20 **Effect of SX on microbial populations inhabiting in solutions of a heap bioleaching process**

Cecilia Demergasso and Víctor Iturriaga, Centro de Biotecnología "Profesor Alberto Ruiz", Universidad Católica Del Norte & Centro de

SESSION 21: Process chemistry and engineering, San Cristóbal Lecture Hall C

Chair: **Baruch Grinbaum & Oded Lerner**

16:20 **CFD aided design and scale-up of agitated extraction columns**

Enes Aksamija, Rainer Pfeffer, Marlene Fritz and Matthaüs Siebenhofer, Institute of Chemical Engineering and Environmental Technology, Graz University of Technology, Austria

16:40 **Extraction of Co(II) by di (2-ethylhexyl) phosphoric acid in a microfluidic device**

Davide Ciceri, Jilka M. Perera and Geoff W. Stevens, Department of Chemical and Biomolecular Engineering, The University of Melbourne, Australia

17:00 **Entrainment quantification in static-mixer settler setup**

Esayas Barega, Edwin Zondervan and André de Haan, Department of Chemistry and Chemical Engineering, Eindhoven University of Technology, The Netherlands

17:20 **The application of highly integrated centrifugal contactor-separator devices for reactive extractions**

Boelo Schuur, Carolus B. Rasrendra, Gerard N. Kraai, Jos G.M. Winkelman and Hero J. Heeres, Department of Chemical Engineering,

Department of Chemical Science and Engineering, Miyakonojyo National College of Technology, Japan; Masahiro Yoshida, Department of Chemical Engineering, Kagoshima University, Japan

Investigación Científica y Tecnológica para la Minería (CICITEM), Chile; Federico Palacios, Ricardo Valdebenito and Sergio Davis, Minera Escondida, Chile

University of Groningen, The Netherlands; Johannes. G. de Vries, Stratingh Institute for Chemistry, University of Groningen, The Netherlands

17:40 **Separation of copper(II) and nickel(II) by micellar extraction**

Laurence Dupont-Leclercq, Sébastien Giroux, Bernhard Henry and Patrice Rubini, Faculty of Sciences and Technology, UHP-Nancy Université, France

17:40 **Separation of Ti(IV), Fe(III) and Mg(II) by three-liquid-phase extraction in the presence of EDTA**

Keng Xie, Kun Huang and Huizhou Liu, Institute of Process Engineering, Chinese Academy of Science, China

17:40 **Laboratory and pilot studies to combat process emulsions at Cominak uranium solvent extraction plant**

Neilesh Syna and Bruno Courtaud, Section d'Etudes de Procédés et d'Analyses (SEPA), AREVA, France; Nicholas Golles and Mamane Ibrahim, Compagnie Minière D'Akouta (Cominak), Niger

18:00-19:00 **COCKTAIL** Foyer

19:00-22:00 **CARL HANSON AWARD CEREMONY & CONFERENCE DINNER** Parque Bohío (garden)

Friday, 7 October

08:20-08:30 **Programme Presentation and News Update**, Fernando Valenzuela, Technical Coordinator

PLENARY SESSION 4 Chair: **Keith R. Barnard**, San Cristóbal Lecture Halls B & C

08:30-09:15 **Active water-oil interface: model systems for evaluating the activity of a complexing agent for liquid-liquid extraction**
Olivier Diat, Amelie Banc, Caroline Bauer, Pierre. Bauduin and Thomas Zemb, Marcoule Institute of Separative Chemistry, France

09:15-10:00 **pH profile control in a Bateman pulsed column—application for stripping of uranium**
Baruch Grinbaum and Eliyahu Buchalter, Bateman Advanced Technologies, Israel; Marthie Kotze and Renne De Preez, Mintek, South Africa

10:00-10:40 COFFEE BREAK / POSTER PRESENTATIONS

Foyer and O'Higgins Lecture Hall

SESSION 22: Process chemistry and engineering,
San Cristóbal Lecture Hall A

Chair: **Hans-Jörg Bart & Matthias Mickler**

SESSION 23: Analytical and preparative applications, San Cristóbal Lecture Hall B

Chair: **Kaoru Fujinaga & Fernando Valenzuela L.**

SESSION 24: Novel reagents, materials and techniques, San Cristóbal Lecture Hall C

Chair: **Masahiro Goto & Boelo Schuur**

10:40 **Proper agitator design for pumper and auxiliary tanks in copper solvent extraction plants**
Richard O. Kehn and Joseph Kontur, SPX Flow Technology—LIGHTNIN, USA

10:40 **NMR investigation of the lanthanide and actinide complexes of bis-triazine extracting agents**
Jean F. Desreux, Geoffrey Vidick and Nouri Bouslimani, Department of Chemistry, University of Liège, Belgium

10:40 **N,N-disubstituted monoamides in the recovery of iron(III) from chloride media**
Lília C. Ribeiro and Ana P. Paiva, Chemistry and Biochemistry Centre, Faculty of Science, Universidade de Lisboa, Portugal

11:00 **Taylor-couette flow for liquid-liquid extraction—coupling hydrodynamics and mass transfer**
Marouan Nemri, Sophie Charton, Denis Ode and Jean-Yves Lanoë, Commissariat à L'énergie Atomique et aux Énergies Alternatives—Marcoule, France ; Eric Climent, Institut de Mécanique des Fluides, France

11:00 **Powder X-ray diffraction as a tool for structure determination of the extracting ligand dithizone**
Mariano Montiel, Biological Sciences Coordination, Universidad de Tlaxcala, Mexico; Salvador Palomares and Guadalupe Sánchez, Faculty of Sciences, Institute of Metallurgy, Universidad Autónoma de San Luis Potosí, Mexico

11:00 **Glycols recovery using reactive extraction with boronic acid derivatives**
Lesly Y. Garcia-Chavez, Estefania Alonso, Boelo Schuur and André de Haan, Department of Chemical Engineering and Chemistry, Eindhoven University of Technology, The Netherlands

<p>11:20 Characterisation of flows in copper SX settlers William Yang, Kosta Simic, Rueben Rajasingam and M. Philip Schwarz, CSIRO Minerals Down Under Flagship, Australia; Mauricio Chovar, BHP Billiton, Base Metals, Chile Presented by Dave J. Robinson, CSIRO Minerals Down Under National Research Flagship, Australia</p>	<p>11:20 The extraction photometric determination of Ni(II) by using in situ extractant formation method <u>Kaoru Fujinaga</u>, Hiroko Sugiyama, Syunichi Oshima, Yujiro Watanabe and Yu Komatsu, College of Bioscience and Chemistry, Kanazawa Institute of Technology, Japan; Shigeru Matsuo, Advanced Technology Research Laboratories, Idemitsu Co., Japan; Shigekazu Tsurubou, Department of Chemistry, Asahi University, Japan</p>	<p>11:20 2-(imino)bis(N,N-dialkylacetamide) (IDAA)—a novel complexing agent for Pd(II), Tc(VII) and Re(VII) <u>Yuji Sasaki</u>, Morihisa Saeki, Yumi Sugo and Yasuji Morita, Japan Atomic Energy, Japan; Akira Ohhashi and Takeshi Oriyama, Ibaraki University, Japan; Yasuhisa Ikeda and Mohammad C. Ali, Tokyo Institute Technology, Japan</p>
<p>11:40 Design and characterisation of an electrostatic demulsifier prototype for breaking-up W/O emulsions Cibele Konzen, Dirlane M. Albino, <u>Julio C. Balarini</u>, Adriane Salum and Tânia L.S. Miranda, Chemical Engineering Department, Universidade Federal de Minas de Gerais, Brazil; Alexandre Konzen (†), HeartWare-HW Sistemas, Brazil; Luiz C. Meira-Belo, Centro de Desenvolvimento da Tecnologia Nuclear-CDTN/CNEN, Brazil</p>	<p>11:40 Development of the method of equilibrium calculation in extraction systems with TBP <u>Alexander Ochkin</u>, Dmitry Gladilov and Sergey Nekhaevskiy, D. Mendeleev University of Chemical Technology of Russia, Russia</p>	<p>11:40 Polymer induced aqueous two phase systems for extractive concentration of aqueous salt solutions <u>Miran Milošević</u>, Boelar Schuur and André de Haan, Process System Engineering, Eindhoven University of Technology, The Netherlands</p>
<p>12:00 Development of a continuous electrostatic demulsifier for splitting high stability W/O emulsions Cibele Konzen, <u>Julio C. Balarini</u>, Tânia L.S. Miranda and Adriane Salum, Chemical Engineering Department, Universidade Federal de Minas Gerais, Brazil; Luiz C. Meira-Belo, Centro de Desenvolvimento da Tecnologia Nuclear-CDTN/CNEN, Brazil</p>	<p>12:00 Reactivity of tributyl phosphate with various organic extractants <u>Keith R. Barnard</u> and Denis W. Shiers, CSIRO Minerals Down Under National Research Flagship, Australia</p>	<p>12:00 Solvent extraction of systems with high viscosity <u>Andreas Pfenning</u>, Donni Adinata and Jan Kröckel, AVT-Thermal Process Engineering, RWTH Aachen University, Germany</p>
<p>12:20 Comparison of two treatment routes for primary cobalt metal production—direct solvent extraction vs intermediate precipitation <u>Sean Scott</u> and Peter Cole, TWP Projects, South Africa</p>	<p>12:20 Diffusion-NMR elucidation of modifier-oxime interactions Douglas J. Harris, Cytec Industries, USA; <u>Benjamin D. Roach</u>, Peter A. Tasker, School of Chemistry, University of Edinburgh, United Kingdom</p>	<p>12:20 Solvent extraction plant performance <u>Miguel Vargas</u>, Minera Gaby, Chile</p>

12:40-13:00

CLOSING CEREMONY

Closing remarks:

Eng. Carlos Barahona, ISEC 2011 Executive Director, Gecamin, Chile
Prof. Dr. Fernando Valenzuela, ISEC 2011 Technical Coordinator, Universidad de Chile, Chile
Dr. Jorge Menacho, ISEC 2011 Chair, De Re Metálica, Chile
Prof. Hans-Jörg Bart, Secretary of the International Community for Solvent Extraction

13:00

FAREWELL COCKTAIL, Foyer

14:00

CLOSING LUNCH, Parque Bohío (garden)