

# ISEC2017

## The 21st International Solvent Extraction Conference

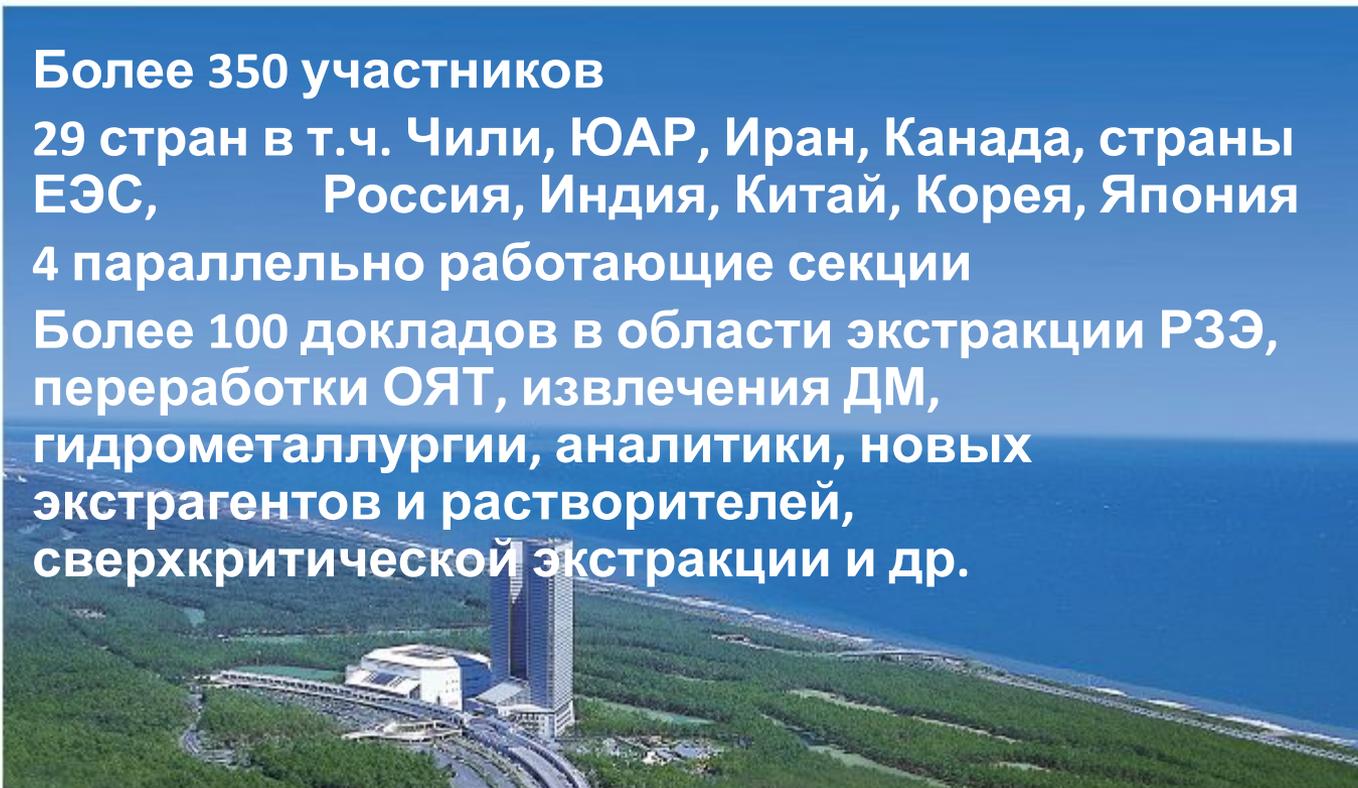
November 5 - November 9, 2017  
Seagaia Convention Center, Miyazaki, Japan

Более 350 участников

29 стран в т.ч. Чили, ЮАР, Иран, Канада, страны  
ЕЭС, Россия, Индия, Китай, Корея, Япония

4 параллельно работающие секции

Более 100 докладов в области экстракции РЗЭ,  
переработки ОЯТ, извлечения ДМ,  
гидрометаллургии, аналитики, новых  
экстрагентов и растворителей,  
сверхкритической экстракции и др.



# Компании участники конференции



**ZEON Corporation**



**SOPAT Measure  
Particles Inline**



**CEM EDGE**



is the world's largest primary producer of platinum, accounting for about 38% of the world's annual supply.

Экстракционные технологии аффинажа МПГ

Группа компаний



Разработка химико-технологических процессов в области переработки различных видов сырья; изготовление оборудования (экстракционного, сорбционного, емкостного, фильтровального, вентиляционного, лабораторного, гальванического, оборудования по газоочистке и др.)

ТриАрк Майнинг – СП ICT Group и компании «РТ-Глобальные ресурсы» Госкорпорации «Ростех», добыча и переработка РЗМ и ниобия, производство высокотехнологичных материалов на основе РЗМ.



# Стендовые доклады

## EFFECTIVE SEPARATION OF Pt(IV), Pd(II) AND Rh(III) IN ACIDIC SOLUTION BY USING PHOSPHONIUM IONIC LIQUID

Mochamad Lutfi Firmansyah<sup>1</sup>, Fukiko Kubota<sup>1</sup>, Masahiro Goto<sup>1,2\*</sup>

<sup>1</sup>Department of Applied Chemistry, Graduate School of Engineering, Kyushu University  
<sup>2</sup>Center for Future Chemistry, Kyushu University

**Abstract**  
Development of effective extraction systems for PGMs using phosphonium ionic liquid using novel phosphonium ionic liquid, tricothyldecyl phosphonium chloride for PGMs extraction

**Experimental**  
Development of effective extraction systems for PGMs using phosphonium ionic liquid using novel phosphonium ionic liquid, tricothyldecyl phosphonium chloride for PGMs extraction

**Application**  
Fuel Cell, Automobile catalyst, Electronic device

**PGMs Consumption**  
Automobile 60%, Jewelry 37%, Electronic 2%

**PGMs production limitation**  
Present in low quantity, Difficult to collect, Unstable supply, Huge gap between supply and demand

**Alternatives PGMs Source**  
Waste Recycling, Automobile waste 40%, Jewelry waste 19%, Electronic waste 24%

**IONIC LIQUID**  
Negligible vapor pressure, Non-flammable, Tunable properties, Structure design, Anion-cation pairing

**Hydrophobic ionic liquid**  
Water, Hydrophobic ionic liquid

**Novel Designed and Synthesized**  
Tricothyldecylphosphonium chloride, Trihexyltetradecylphosphonium chloride

**ICP-OES**  
Metal Concentration, Volume phase, Organic phase, Aqueous phase, Stripping phase

## Synthesis of methacrylate-Styrene Copolymer Containing a Sulfur Atom and Extraction Equilibrium of Gold(III) from Hydrochloric Acid

Minako Iwakura<sup>1</sup>, Takafumi Hanada<sup>1</sup>, and Yoshinari Baba<sup>2</sup>

<sup>1</sup>Chemical Science and Technology, National Institute of Technology, Miyazaki College, Miyazaki, Japan  
<sup>2</sup>Department of Applied Chemistry, University of Miyazaki, Japan

**Introduction**  
Consumption of Rare metals in Japan 70% OF THE WORLD!  
Wastes of Urban mine (containing rare metals) Potential resources Au 150\$/t

**method**  
Solvent extraction: selective recovery, large extraction capacity, easy back-extraction  
Recovery: extractant, organic solvent, metal ions, acid

**Synthesis**  
Functional group (S and N atoms)  
Polymer skeleton: methyl 2-(chloromethyl)-2-methylacrylate (CMC), methyl 2-(chloromethyl)-2-(3-(trimethylsilylthio)propyl)acrylate (MTPS)

**Physical properties**  
Molecular weight: 5.4 x 10<sup>3</sup> [g/mol] (Chloroform), 16.1 [mM/ml]  
Interfacial tension: 0.25wt%-ATPS /chloroform, 0.1mM Metal

**Quantitative of Nitrogen atom**  
Adsorption amount of N: 0.25wt%-ATPS /chloroform, HCl solution, shaking, 24h, 303K, Titration by NaOH

**Reactor and synthesis step**  
Reflux, 120rpm, MP 4g / DMF, K<sub>2</sub>CO<sub>3</sub> 5g, DMF 200ml, Separation: 0.1M-HCl, 0.1M-NaOH, Evaporation, polymer gel, Yield: 66%

**Extraction selectivity in HCl solution**  
Pd(II), Pt(IV), Au(III)

**Extraction from mixed solution**  
Cu: 0.1 ~ 25mM, 1.5M HCl

**Changes in extraction ratio with time**  
Loading test of Pd(II)

## Selective extraction of antimony and arsenic with alkylated piperazine

(Miyazaki University) Shintaro Kanemaru<sup>1</sup>, Rieko Miura, Tatsuya Oshima, Yoshinari Baba

**1. Introduction**  
**antimony**  
Antimony is superior in incombustibility and wear resistance.  
Flame retardant auxiliary, Lead battery  
Resources are maldistributed in the specific countries, and Japan depends on the import  
e-waste recycling rate is almost 0%  
environmental pollution problems

**arsenic**  
As for arsenic, a compound with gallium is superior in semiconductor properties.  
Solar light panel, Light emitting diode

**Development of the selective extractant is important.**

**What is a solvent extraction?**  
Solvent extraction is a selective separation method for isolating and concentrating an objective material from aqueous solution containing extractant.

**3. Results and discussion**  
**Metal extraction selectivity**  
TEHA, DDCMP, log[HCl]<sub>aq</sub>

**Stripping of metals extracted**

## PGM Extraction Properties of Calix[4]arene-Based n-Dialkylamino Extractants from Leach Liquors of Automotive Catalysts

Manabu Yamada<sup>1</sup>, Yu Kaneta<sup>2</sup>, Muniyappan Rajiv Gandhi<sup>2</sup>, Yoshihiko Kondo<sup>2</sup>, Uichi Akiba<sup>2</sup>, Kenshu Fujiwara<sup>2</sup>

<sup>1</sup>Research Center for Engineering Science, Graduate School of Engineering Science, Akita University  
<sup>2</sup>Department of Life Science, Graduate School of Engineering Science, Akita University

**Introduction**  
**Solvent Extraction**  
Organic phase, Aqueous phase, Extraction, Stripping, SME

**Developed Calixarene Extractants**  
These calixarene-based extractants have poor solubility in organic solvents. Generally, solvent extraction by calixarene-based extractants is carried out using chloroform as a diluent, which is harmful to the human and the environment. Developing a calixarene-based extractant which shows good solubility.

**This time Developed Extractants**  
By introducing hydrophobic and long alkyl chains, Extractants may show solubility in hydrocarbon-based diluents such as toluene.

**Experimental**  
**Synthesis of Calixarene-based Extractants**  
Scheme 1: Synthesis of p-dialkylaminomethylcalix[4]arenes  
HCHO, R<sub>2</sub>NH, AcOH, THF, r.t.

**Extraction Procedure**  
Shaking 300 rpm, Centrifugation 3500 rpm

**Result**  
**Solubility of extractants for diluents**  
Table 1: Investigation of solubility of 1 - 8 in diluents

Diluents	Boiling point (°C)	Dielectric constant	Solubility in diluents							
			1	2	3	4	5	6	7	8
CHCl <sub>3</sub>	61.0	4.81	N.S.	G.S.						
1,2-Dichloroethane	83.5	10.38	—	G.S.						
p-Dichlorobenzene	180.3	9.93	—	N.S.	G.S.	G.S.	G.S.	G.S.	G.S.	G.S.
Chlorobenzene	131.0	9.62	—	N.S.	G.S.	G.S.	G.S.	G.S.	G.S.	G.S.
Toluene	110.0	2.38	—	N.S.	N.S.	G.S.	G.S.	G.S.	G.S.	G.S.
Xylene	138.4	2.20	—	N.S.	N.S.	N.S.	N.S.	G.S.	G.S.	G.S.
Kerosene	150-300	1.80	—	N.S.	N.S.	N.S.	N.S.	G.S.	G.S.	G.S.
Shellcil D70 <sup>®</sup>	193-245	2.10	—	N.S.	N.S.	N.S.	N.S.	G.S.	G.S.	G.S.



# Приглашение на конференцию ISEC-2020

# ISEC 2020 in Sweden





**GOTHENBURG**

**Sweden**



### BETWEEN MEETINGS

**Gastronomic brilliance**  
This gourmet's dream offers innovative cuisine using local produce. Specialty fish and shellfish is our claim to fame. Cuisine from all over the world is offered at reasonable prices at first-class, gourmet, trendy or traditional restaurants. Sjörens vägskär are awarded with a Guide Michelin star.

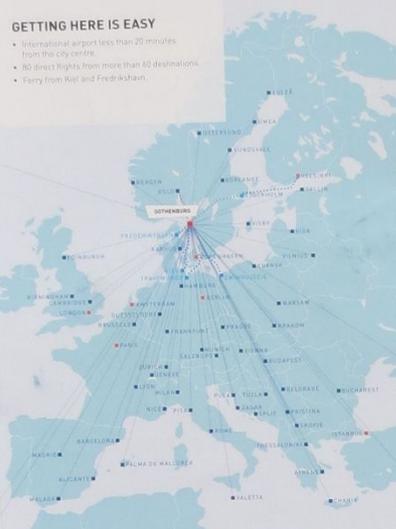
**Attractions**  
Gothenburg and West Sweden offers an exceptional combination of city life, culture and nature. Historical and contemporary attractions and activities are miles with a wide repertoire of entertaining shows, sports, cultural events, shopping, fairs and exhibitions.

A number of prominent cultural institutions are found in five minutes walking distance. View the unique collection of Nordic art at the Museum of Art or enjoy Gothenburg Symphony Orchestra at the Concert Hall.

**Relax**  
In less than half an hour you'll be on a boat taking you to the picturesque islands of the archipelago. The many islands stretch along the coast like a string of pearls. The many tree-covered parks, as well as forests and lakes are only a stone's throw away.

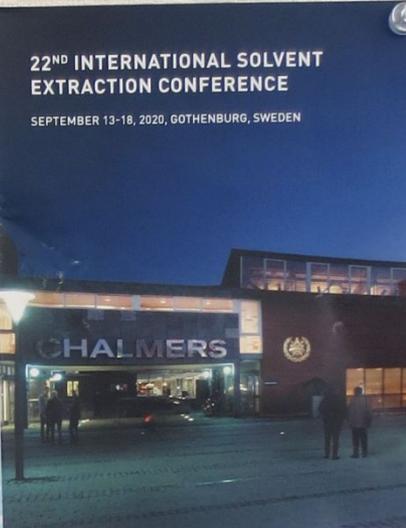
### GETTING HERE IS EASY

- International airport less than 20 minutes from the city centre.
- 80 direct flights from more than 60 destinations.
- Ferry from Kiel and Friedrichshafen.



## 22<sup>ND</sup> INTERNATIONAL SOLVENT EXTRACTION CONFERENCE

SEPTEMBER 13-18, 2020, GOTHENBURG, SWEDEN



**CHALMERS** | **ISEC** International Solvent Extraction Conference | **gothenburg**

COPPER INTERNATIONAL CONFERENCE  
AUGUST 18-21, 2019 | VANCOUVER, BC, CANADA

**SAVE THE DATE**

Metsoc, the 58<sup>th</sup> annual Conference of Metallurgists (COM 2019) and CIM are honoured to host Copper 2019, marking a milestone in the International Copper Conference Series with the 10<sup>th</sup> Edition.

**Featuring:**

- Mining & Geology
- Mineral Processing
- Electrowinning & Electrorefining
- Pyrometallurgy
- Hydrometallurgy
- Process Control
- Sustainable Development, Health & Safety, and Environment
- And more!

**Conference Chair:** COM 2019 Chair: Dr. Edward Asselin, University of British Columbia  
**Copper Chair:** Dr. Jari Kapusta, BSA Inc.

Plan to join us for the largest international copper event in Vancouver in 2020

metsoc.org

**Cu IN VANCOUVER IN 2019**

**August 18-21, 2019**  
Vancouver, BC, Canada

**COPPER 2019** | COPPER INTERNATIONAL CONFERENCE | 10<sup>th</sup> Edition

Hosted by: COM 2019 | metsoc.org