IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC1	**Abbey**	**Charles Ebenezer**	*Missouri University of Science and Technology*	*Michael S. Moats*	**EFFECT OF COBALT CONCENTRATIONS ON COPPER ELECTROWINNING**	The effect of cobalt concentration in copper electrolytes on anode potential was examined using a successive combination of chronopotentiometry and linear sweep voltammetry. A current density of 300 A/m2 was applied to polished Pb-Ca-Sn samples with electrolyte Co concentrations over a range of 0.1-0.6 g/L Co in a 170 g/L H2SO4 electrolyte containing 0.6 g/L Mn and 20 mg/l Cl at 50oC. Results indicate that there will likely be an increased power requirement and electrical costs if the cobalt concentration was decreased below 600 mg/L. Estimates of power consumption and cost were provided as a function of cobalt concentration. Linear sweep voltammetry immediately following chronopotentiometry indicated that a Co concentration decrease will likely increase the manganese oxidation rate.
P-IMPC2	**Agarwal**	**Vivek**	*PhD student at South Dakota School of Mines and Technology*	*M.S. Safarzadeh, South Dakota School of Mines and Technology; Jennifer Galvin, South Dakota School of Mines and Technology*	**SOLVENT EXTRACTION OF LANTHANUM (III) USING PC-88A EXTRACTANT DILUTED IN KEROSENE**	Lanthanum (La) occurs in nature with other rare earth elements in numerous minerals such as bastnÃ¤site ((Ce,La,Y)CO3F) and monazite ((Ce,La,Nd,Th)PO4) and has a wide range of applications including nickel-metal hybrid rechargeable batteries used in hybrid vehicles and also lanthanum plays an important role as a catalyst in oil refining in petroleum cracking. In this investigation, the solvent extraction of La from aqueous media has been investigated. The effects of aqueous equilibrium pH, various acid media (H2SO4, HCl, and HNO3), extractant (PC-88A) concentration, initial lanthanum concentration and temperature on solvent extraction of La were systematically investigated. Based on the experimental results, HNO3 and HCl were found to be the preferred aqueous media for solvent extraction of La. The most promising experimental conditions (pH, concentration of PC-88A and concentration of La, temperature) were identified. A molecular modeling approach was also used to understand the metal ion-organic extractant interaction.
P-IMPC3	**Ang**	**Cheen Aik**	*University of Toronto, Department of Chemical Engineering and Applied Chemistry*	*Gisele Azimi, University of Toronto*	**RECOVERY OF HEMATITE FROM HIGH-PRESSURE ACID LEACH RESIDUE**	Laterite ore is an important source of strategic elements, such as nickel and cobalt. Current extraction process, High-pressure acid leach (HPAL) process, generates substantial waste. Therefore, converting waste residue from HPAL process into a salable product will be advantageous. The current study investigates the feasibility of using selective flocculation and froth flotation to recover hematite, a source of iron for steel-making industry, from HPAL residue. XRF analysis identified that hematite represents 70 wt.% of residue. XRD analysis identified hematite, silica, alunite, and magnesium silicate as main phases present. Particle size analysis and SEM images showed that most particles are less than 2 micron. First, selective flocculation was used to increase particle size. Froth flotation was used to separate hematite from gangue material. Various parameters, including collector type, pH, and flocculants were investigated to obtain an optimum recovery. The results of the present study is commercially viable and reduce environmental burden.

IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC4	**Bochevskaya**	**Yelena**	*Centre of Earth Sciences, Metallurgy and Ore Beneficiation, Almaty, Kazakhstan*	*Z. S. Abisheva, A. N Zagorodnyaya, A. S. Sharipova, E. A. Sargelova*	**PRECIPITATION OF ISOTOPE OSMIUM-187 FROM THE WASTEWATER OF COPPER PRODUCTION WITH USE OF DIFFERENT REAGENTS**	The work shows results of experiments on selection of the optimal conditions of maximum osmium precipitation from the wastewaters. The concentration, duration and temperature influence on the process of Os precipitation by different reagents â€“ precipitators: thiosulphate Na2S2O3 and sodium sulphide Na2S was studied. An osmium precipitation mode is offered with the presence of Na2S2O3 with addition of potassium iodide KI from the new type of wastewaters. The wastewaters were produced after rhenium extraction from industrial ammonia solutions representing combined mother solutions of operations of solid-phase re-extraction and dissolution of pulp of crude ammonium perrhenate. They have a significantly higher osmium concentration varying from 5 to 15 mg/L. It was established that use of KI allowed reducing Na2S2O3 consumption for osmium precipitation operations 4 to 5 times if compared to the method existing in the production. Optimum conditions of precipitation of isotope osmium-187 from the new type of wastewaters are: KI concentration into the solution 0.65 g/L, addition of Na2S2O3 to the solution to have the concentration of 5.0 g/L, temperature 90 Â°Đ¡, and duration - 5 h. During the experimental period Os recovery in the Os-containing precipitation was achieved at 58 %.
P-IMPC5	**Je**	**Jinyoung**	*Seoul National University*	*Jihoe Kwon, Seoul National University; Heechan Cho, Seoul National University*	**A NEW SURFACE TENSION MODEL FOR SPH ON THE BASIS OF INTER-PARTICLE REPULSION**	Smoothed particle hydrodynamics (SPH) is one of the computational fluid dynamics methods using Lagrangian approach. In this study, a new surface tension formulation for SPH is proposed. Surface tension is occurred because of the unbalanced forces between molecules in interface. Therefore, we describe surface tension using particle-particle repulsion which is more numerically stable in SPH than attraction. The repulsive force depends on the surface properties and there is no repulsive force between particles of the same type and bigger force when there is a large characteristic difference. This surface tension model successfully simulate the various surface tension phenomena such as water drop, contact angle, and capillary rise.

IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC6	**Jenssen**	**Ina Beate**	*Norwegian University of Science and Technology*	*Hans Vigeland Lerum, University of Oslo; Alessio Vascon, University of Oslo*	**THE NORWEGIAN HYDROMET PROJECT: REVITALIZING HYDROMETALLURGICAL COMPETENCE AND RESEARCH**	Funded by the Norwegian Research Council and Industry, Hydromet started in 2014 as a Norwegian competence-building project in hydrometallurgy. The project aims at revitalizing and developing hydrometallurgical education and research in Norway by addressing key challenges faced by the Norwegian industry. The goal is to establish a sustainable education and training program which will provide skilled candidates for the hydrometallurgical industry. Project partners are both industrial and academic: Yara International ASA, Glencore Nikkelverk AS, and Boliden Odda AS collaborate with the University of Oslo, the Norwegian University of Science and Technology, the Institute for Energy Technology, and SINTEF Materials and Chemistry to address current challenges within the industry production processes. The challenges are mainly related to feed materials with increasing amounts of contaminants. The poster introduces the Hydromet project to the public by detailing the challenges faced by the industrial partners and the corresponding research aiming at finding solutions.
P-IMPC7	**Kim**	**Kiho**	*Chung-Ang University*	*Hyun Ju, Chung-Ang University; Jooheon Kim, Chung-Ang University*	**VERTICAL PARTICLE ALIGNMENT OF TITANIUM OXIDE COATED BORON NITRIDE/EPOXY COMPOSITE FOR THERMAL CONDUCTIVITY ENHANCEMENT**	Anisotropic boron nitride (BN) was vertically aligned along the direction of heat transport using external electric field. Titanium oxide (TiO2) nanoparticle which has superior dielectric property deposited onto BN surface act as an electrically responsive material allowing particle alignment. Due to the relatively high dielectric property of vertical direction than that of horizontal direction of BN, raw BN particles were oriented to perpendicularly with electric field. After the surface modification using titanium oxide, polarization of highly dielectric titanium oxide in the electric field leads to the formation of vertical particle arrangements. The through-plane thermal conductivity of the synthesized vertically aligned composite increased from 3W m^-1 K^-1 to 7W m^-1 K^-1 with 30 vol% filler loading that is over 2 time fold increase compared with a randomly oriented composite.
P-IMPC8	**Korgiopoulos**	**Konstantinos**	*McGill University*	*Luis Angel Villegas Armenta,McGill University;Amir R. Farkoosh,McGill University; Mihriban Pekguleryuz;McGill University*	**MODIFICATION OF Î²-PHASE IN MG-6AL CAST ALLOYS WITH TRACE YTTRIUM ADDITIONS**	Magnesium alloys are attractive lightweight materials for transport industry as they offer a viable approach for reduced CO2 emissions and fuel economy. The Mg-Al based alloys are the most widely used automotive Mg alloys. In order to expand their use in crashworthy components such as car body applications, the ductility should be enhanced. Modification of the distribution and morphology of Mg17Al12 intermetallics via trace additions is a promising approach to enhance the ductility. In the short-term, the present work aims at investigating yttrium additions to understand the underlying mechanism of its modification effect on Mg17Al12 so that other trace additions can be selected for developing Mg-Al alloys with improved ductility. In the design stage, thermodynamic calculations are conducted via the FactSageTM software. Three Mg-6Al-xY alloys (x=0, 0.07, 0.3 in wt.%) are characterized through scanning electron microscopy, and X-ray diffraction. Mechanical properties are evaluated via room-temperature tensile tests.

IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC9	**Lerum**	**Hans Vigeland**	*University of Oslo*	*Aud MjÃ¦rum Bouzga, Sissel JÃ¸rgensen, Dirk Petersen, Dag Ã˜istein Eriksen, Eddy Walter Hansen, Jon Petter Omtvedt, Grethe Wibetoe*	**LIQUID-LIQUID EXTRACTION OF CADMIUM CHLORIDE COMPLEXES STUDIED BY NMR**	Cadmium can occur as a contaminant in the process feeds for nickel. Such feeds tend to have very high salinity which makes the speciation and lability of cadmium difficult to predict. To better understand the underlying process in cadmium extraction, NMR was performed on 113Cd. NMR spectroscopy enables characterisation of the distribution of cadmium-chloride complexes in the solution. In addition liquid-liquid extraction was performed using the radionuclide 109Cd to trace the transfer of cadmium between the organic and the aqueous phase. The investigations were performed in solutions having nominal concentrations of chloride ranging from 0.1 M to 5 M. Transfer of cadmium from the aqueous phase to the organic phase was accomplished using Aliquat 336. NMR showed that the chemical shift was significantly affected by the chloride concentration and less affected by the ionic strength of the solution.
P-IMPC10	**Mackowiak**	**Kristian**	*Queen's University*	*J. Forster, Queen's University; C.A. Pickles, Queen's University*	**SOLID STATE MICROWAVE CARBOTHERMIC REDUCTION OF CHROMITE**	Solid state microwave carbothermic reduction of chromite ores is being investigated as a method to produce a ferrochromium alloy. Firstly, thermodynamic modelling was performed using HSC 7 in order to determine the optimal reducing conditions both in argon and vacuum. Secondly, compacted briquettes of chromite ore and carbon were prepared at the carbon contents predetermined by the model. Thirdly, tests were performed in a 1.2 kW microwave unit. Finally, the samples were analyzed by scanning electron microscopy, electron microprobe analysis, and mineral liberation analysis. The results indicated that for the same conditions, the samples reduced under vacuum exhibited a higher degree of metallization and as a result higher grades could be achieved. Chromium contents in the range of 60-70% could be obtained in the alloy, reaching as high as 80%. Methods for recovering the ferrochromium from the reacted briquette are being investigated.
P-IMPC11	**Owens**	**Camilla**	*Camborne School of Mines, University of Exeter*	*Dr Kathryn Hadler, Imperial College London; Dr Robert Fitzpatrick, Camborne School of Mines, University of Exeter; Professor Frances Wall, Camborne School of Mines, University of Exeter*	**RECOVERY OF REES FROM A MIXED APATITE-SYNCHYSITE ORE**	Rare earth elements (REE) are vital to a hi-tech renewable future and are present in everything from iPhones to wind turbines. Currently 97% of the world's REE are supplied by China and demand is set to rise. Songwe Hill, a carbonatite deposit in the Chilwa Alkaline province in Malawi, is an exciting prospect for extraction of REE. Songwe Hill contains two rare earth bearing minerals, synchysite and apatite, which are amenable to separation from the rock matrix by froth flotation. Mineral association and liberation has been determined by QEMSCAN, showing synchysite and apatite closely associated with carbonate gangue minerals. By investigating the fundamental surface characteristics of synchysite and apatite, this project aims to determine the effect of chemical and physical parameters on the separation performance.

IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC12	**Reid**	**Sable**	*University of Toronto*		**RECOVERY OF RARE EARTH ELEMENTS FROM RED MUD**	Rare earth elements (REEs) are crucial for the production of technologically advanced products and hence they are in increasingly high demand. The increasing demand and limited supply of these elements requires investigation into secondary sources through technospheric mining, such as recovery from stocks of landfilled industrial process residues. Although these sources contain low concentrations of REEs, their volume is large; therefore they can provide significant amounts of these elements. Red mud, which is the residue of bauxite processing in the Bayer process in the aluminum industry, contains some amounts of REEs. In this work, we obtained red mud samples from Rio Tinto, and performed a thorough characterization utilizing acid digestion followed by ICP-OES, XRF, XRD, XPS, TOF-SIMS, SEM-EDS, and TEM-STEM to determine the composition, morphology, and distribution of REEs within the sample. We are in the process of developing an economic and efficient leaching process to recover these elements.
P-IMPC13	**Sadri**	**Farzaneh**	*Queen's University*	*Amir Mohammad Nazari, Postdoctoral fellow; Ahmad Ghahremaninezhad, University professor*	**A REVIEW ON THE CRACKING, BAKING AND LEACHING PROCESSES OF RARE EARTH ELEMENT CONCENTRATES**	This poster reviews the cracking and leaching methods applied to REE concentrates to produce an intermediate product for further REE separation.
P-IMPC14	**Schons**	**Didier**	*Technische UniversitÃ¤t Braunschweig, Institute for Particle Technology*	*Arno Kwade, Technische UniversitÃ¤t Braunschweig, Institute for Particle Technology*	**OPERATION GUIDELINES FOR THE ISAMILLTM BASED ON THE AXIAL GRINDING MEDIA DISTRIBUTION**	The IsaMillTM technology with its internal classifier allows an operation in a wide range for the fine grinding of minerals in an open circuit. Even though a lot of experience in the IsaMillTM processing was gained in the last two decades, a poor operation on site can still occur due to a lack in understanding the transport phenomena occurring in the mill. A series of tests has been carried out, varying the stirrer tip speed, the grinding media size and density, the overall filling ratio, the fluid viscosity and other parameters in order to investigate their effects on the axial grinding media distribution in the IsaMillTM. These results are used to draft operation guidelines for the fine grinding in the industrial scale ensuring an adequate setting of the process
P-IMPC15	**Schons**	**Didier**	*Technische UniversitÃ¤t Braunschweig, Institute for Particle Technology*	*Arno Kwade, Technische UniversitÃ¤t Braunschweig, Institute for Particle Technology*	**AGING OF GRINDING MEDIA IN WET STIRRED MEDIA MILLING**	With the development of inert grinding media for the fine grinding of ore particles in the IsaMillTM the overall process efficiency improved. During the last years, a series of papers have discussed the advances in ceramic media for an optimized grinding process. Several manufacturers are permanently improving their grinding media. One focus is often on a higher wear resistance. However, the aging of the ceramic media with an initially high quality is not satisfactory referred so far. Therefore, grinding media from different suppliers are compared in this work considering the change in their properties while they get worn under identic conditions in a lab scale IsaMillTM. The surface roughness is determined by atomic force microscopy in order to see if the media smoothed after a long term stressing. Furthermore, the Youngâ€™s modulus is measured as it can be used to estimate the energy transfer on the particles to be ground with each impact.

IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC16	**Shahini**	**Shayan**	*University of Toronto*	*Gisele Azimi*	**RARE EARTHS CONTAINING CERAMIC MEMBRANES FOR HIGH TEMPERATURE GAS FILTRATION**	Many industrial processes emit off gas streams consisting of mixed gases with particulate matters. Since most of them run at elevated temperatures, ceramic filters are the material of choice to manage the off gas. Most of ceramic filters available in the market can operate up to maximum 1000Â°C; however some applications need a filter that can sustain temperatures of up to 1800Â°C. In this work, we designed and fabricated porous ceramic membranes, made of rare earth oxide ceramics, that can sustain high temperatures up to 1800Â°C. We utilized high temperature powder processing techniques to sinter high melting point ceramic filters, made of yttria stabilized zirconia. Several fabrication recipes were investigated to obtain the optimum sintering conditions that will provide suitable porosity and pore distribution, mechanical strength, and high gas permeability. Systematic experiments were conducted to study the effect of ceramic and polymer particle size, sintering temperature, and ceramic-to-polymer content ratio.
P-IMPC17	**Simba**	**Kalumba Pascal**	*University of South Africa*		**FINENESS OF THE GRIND PRODUCED BY MIXTURES OF GRINDING MEDIA OF DIFFERENT SHAPES.**	The grinding process is satisfactorily described using the population balance model expressed in terms of the selection function and the breakage function. The effects of grinding media on milling and milling kinetics have been studied using one media shape and, sometimes compared performances of two or more different media shapes. However, very little work has been done on investigating mixtures of media shapes. However, the volume of grinding zones can be increased when there is an optimal mixture of two grinding media with different shapes and, therefore the milling kinetics will be improved. This work has shown that, though mixtures of grinding media have proven to have good milling kinetics, they are slow to produce the fines required for the milling process.
P-IMPC18	**Suriano**	**Anne-Marie Suriano**	*South Dakota School of Mines and Technology, Pacific Northwest National Lab*		**DEVELOPMENT OF ELECTROREFINED ULTRA-RADIOPURE ALLOYS**	The next generations of low background underground experiments searching for extremely rare physics interaction processes, such as neutrinoless double-beta decay or dark matter, require ultra-clean structural materials containing the smallest obtainable amounts of naturally occurring radioactive uranium (U) and thorium (Th) contaminants. Most materials contain trace amounts of U and Th, and quantities as low as parts per quadrillion are important to these experiments. Pacific Northwest National Laboratory (PNNL) has developed a method of electroforming copper (Cu) to exclude these contaminants and yield copper of extreme purity while plating to a thickness over a centimeter. The properties of the electrorefined copper are not ideal for mechanical or structural applications due to high ductility and low strength. Adding an alloying element to Cu creates strain fields and pins dislocations, improving strength. An ultra-radiopure copper-chromium electrodeposited alloy that possesses favorable structural properties has been developed. Status of this R&D effort and initial measurements of the alloy's properties are presented.

IMPC 2016
hosting COM 2016

LIST OF STUDENT POSTER SUBMITTERS

Poster ID	Main Contact Last	Main	Main Contact's	Co-authors (if applicable)	Poster Title	Poster Description
P-IMPC19	**Thompson**	**Dominic**	*University of Alberta*		**SILANES AS FLOCCULANTS FOR TAILINGS**	This poster presents research on a novel type of flocculant for mineral processing waste water. Silanes are organic molecules with one or more silicon atoms substituted in place of a carbon. Certain silanes form polymers. Five silanes were tested and two were found to effectively flocculate clay particles in waste water from oil sands mining. Since there is an infinite diversity of silanes compounds, in the same manner as there are infinite carbon-based compounds, it is likely that even better silane flocculants exist. Oilsands tailings are a hard test for flocculants since they prove refractory to many conventional treatment processes. It is likely that silane flocculants could be used in other mineral waste waters, and even other industrial or municipal waste water streams.
P-IMPC20	**Villegas Armenta**	**Luis Angel**	*McGill University*	*Amir R. Farkoosh, McGill University; Konstantinos Korgiopoulos, McGill University; Mihriban Pekguleryuz, McGill University*	**THE INCREASE OF MG IGNITION TEMPERATURE THROUGH THE ADDITION OF SR AND CA**	The low density of magnesium (Mg) is a promising asset for weight reduction of commercial aircrafts. However, the perceived risk of fire in a post-crash scenario prevents the use of Mg alloys as part of cabin components. Previous research shows that the addition of alkaline earth and rare earth elements could increase the ignition temperature (Ti) of Mg, reducing its fire hazard. In this work, a Mg-2.5 Sr-1.0 Ca alloy, with an ignition temperature comparable to that of WE43 or Mg-6 wt% Sr alloys, is proposed. This could be attributed to a protective oxide layer that prevents the contact between Mg and oxygen formed due to the high oxygen affinity of Ca (compared to Mg) and to the reduction of Mg presence at the metal/oxide interface due to the surface active behavior of Sr.
P-IMPC21	**Whitty-Léveillé**	**Laurence**	*Ph.D. Student*	*Nicolas Reynier, Natural Resources Canada; Janice Zinck, Natural Resources Canada; Dominic LariviÃ¨re, UniversitÃ© Laval*	**EVALUATION OF DIGESTION METHODS AND ANALYTICAL TECHNIQUES FOR THE EFFICIENT DETERMINATION OF RARE EARTH ELEMENTS IN GEOLOGICAL SAMPLES**	A new digestion procedure was developed using a fusion apparatus. The high digestion temperature and the use of flux were found to be effective for the digestion of every rare earth elements (REE). A comparison between several analytical techniques for the detection of the metals showed that the results obtained by ICP-MS/MS are in good agreement with the five certified reference materials data tested, whereas the other analytical techniques reveal several spectral interferences for some REE.
P-IMPC22	**Wolosiewiczm**	**Marta**	*AGH University of Science and Technology, Faculty of Mining and Geoengineering, Department of Environmental Engineering and Mineral Processing*	*Dariusz Foszcz (AGH University of Science and Technology, Faculty of Mining and Geoengineering, Department of Environmental Engineering and Mineral Processing)*	**DESIGN OF THE INNOVATIVE ELECTROMAGNETIC MILL WITH THE CONTROL SYSTEM**	Modern industry can not operate without complicated processes of mineral processing, supported by innovative technologies. That was the reason, to design and build a new electromagnetic mill. The poster presents the construction of an innovative electromagnetic mill, which in comparison to traditional solutions provide significant reduction in power consumption and higher technological performance. It can be seen that in comparison to conventional mill, the electromagnetic mill is fully automated system, which affects the effectiveness of its work. Efficiency and effectiveness of the process depends on the appropriate selection of the physical parameters of the system and the process. Direct control of the grinding process is implemented in industrial controllers (PLC) and is supported by the optimisation algorithms that operate in the control system of supervision (SCADA). Development of the poster has been funded in the framework of the project: PBS3/B3/28/2015 and scholarship number: 15.11.100.031