# Abstract Listing

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## 417858: Synthesis of phosphorous compounds in ionic liquids

## IEC 0 [417858]: Synthesis of phosphorous compounds in ionic liquids

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***ACCEPTED***
***Topic Selection:*** *Green (or Greener) Industrial Applications of Neoteric Solvents: Ionic and Supercritical Fluids: High Temperature and Other Systems*
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***Preferred Presentation Format:*** *Oral*
***Consider for Sci-Mix:*** *N*
***Special Equipment Needs:*** *LCD data projector*
***Conforms to Bylaw 6:*** *Y*
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## Abstract

Reactions in ionic media are widely used in chemistry, the theoretical background for their application being well developed. Meanwhile, the most popular ionic solvent, water, does limit the scope of processes with the involvement of organic reagents. In this case the ionic liquids are of particular interest as they give a possibility to increase the selectivity and to control the reaction thoroughly. Our experiments have shown that the polymerization of elemental (white) phosphorus in solutions and emulsions are followed by the formation of low molecular mass products, the type of the solvent used being the key factor, as far as the yields and the structure of the products are concerned. It has been found that the solvatation of the reaction intermediates might affect the kinetics of the processes. The purpose of our research is to investigate the peculiarities of the behavior of phosphorus in ionic liquids. Preliminary spectrophotometric studies have shown that deviations of the optical density of organic solutions of phosphorus from the linearity at higher phosphorus concentrations are due to the formation of the nano-associates of phosphorus molecules. NMR-P(31) studies of the 0.07% mass. solutions of white phosphorus ( chemical shift 521.7 ppm for benzene solutions and 527.0 for hexane ones) demonstrate the interrelation between the properties of the solvent and the status of P4 molecules. To take into account the processes of the formation of P4 complexes in the solutions, we investigated the polymerization of white phosphorus in benzene and hexane in the presence of aluminum halides (chloride and bromide). The initial molar ratio "phosphorus:halide" equaled 1:(0.1-0.8). Phosphorus-based polymeric product was formed at room temperature, containing up to 80%

mass. of phosphorus. The reaction was characterized as the first-order one on phosphorus. The comparison of NMR-P(31) spectra of the samples of red (polymeric) phosphorus synthesized in different reaction conditions showed that the industrial product has a more complicated spectrum in the weak field compared to the one obtained in the reaction in the presence of aluminum halides. Thus a higher uniformity of red phosphorus might be achieved leading to a better stability of the product.

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## 420188: Low temperature acetamide-based melts for electrochemical processes

## IEC 0 [420188]: Low temperature acetamide-based melts for electrochemical processes

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***Topic Selection:*** *Green (or Greener) Industrial Applications of Neoteric Solvents: Ionic and Supercritical Fluids: High Temperature and Other Systems*
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### Abstract

Results of investigation for physico-chemical and electrochemical properties of acetamide-carbamide-NH4Hal melts (where Hal -Cl, F) have been reported: i. Phase diagrams and thermal stability of corresponding binary and ternary systems; ii. Electrode processes and the compositions of the products both in pure melts and under the electro- deposition of copper and silver; iii.Anodic behavior of tungsten and molybdenum.

Possibility to process electroplating, electrolytic separation and refinement of noble metals, electrochemical erosion and milling of noble and refractory metals at temperatures within 60-70 C was determined, and could be considered the most important for industrial application, especially in the part of replacement of toxic content plating solutions.

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## 420583: Electrodeposition of oxygen-free tantalum and synthesis of novel oxygen-containing tantalum compounds from molten salts

## IEC 0 [420583]: Electrodeposition of oxygen-free tantalum and synthesis of novel oxygen-containing tantalum compounds from molten salts

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## Abstract

Tantalum is one of the most corrosion-resisting metals. It can be used successively in chemical, food, medical and pharmaceutical industry (autoclaves, stirrers, heat exchangers, valves, temperature gages etc.), but the high cost of this metal makes reasonable its application only in the form of protective coatings on the surface of some inexpensive metal. To obtain pure, plastic, non-porous and well adherent tantalum layers on articles of complex configuration, the molten salts electrolysis is most advantageous method. But the successful application of tantalum in the form of galvanic coatings necessitates to deposit the metal sufficiently pure in oxygen. On the other side, the joint electrochemical deposition of tantalum and oxygen is an unique way to synthesize novel compounds (the tantalum bronzes) with unusual and promising properties.

The effect of physico-chemical parameters of molten salts system on the cathode process in the melts containing tantalum halides and oxohalides was understood in this work to control the electrochemical behavior of tantalum and oxygen in required direction.

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## 424339: Ammonolysis in supercritical ammonia

## IEC 0 [424339]: Ammonolysis in supercritical ammonia

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***Topic Selection:*** *Green (or Greener) Industrial Applications of Neoteric Solvents: Ionic and Supercritical Fluids: High Temperature and Other Systems*
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## Abstract

Treating pentaerythrityl tetrachloride with excess supercritical ammonia produces pentaerythrityltetramine, $C(CH_2NH_2)_4$; ammonia serves as reagent, solvent and heat transfer agent.

Rate of the ammonolysis is highly pressure-dependent, as expected for a "sterically hindered" nucleophilic displacement. The product tetramine is converted to the water-insoluble disulfate C

$(CH_2NH_3^+)_4(SO_4^=)_2$ by adding sulfuric acid; this disulfate is purified by washing with water. The entire process may be conducted without using organic solvents. (Work done at Chemical Systems Division, United Technologies Corporation.)

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## 435512: Catalytic and electrochemical processes for $SO_2$ and $NO_x$ emission abatement: Part I

## IEC 0 [435512]: Catalytic and electrochemical processes for $SO_2$ and $NO_x$ emission abatement: Part I

**Soghomon Boghosian**[1], Bair S. Bal'zhinimaev[2], Michael Eriksen[3], Rasmus Fehrmann[3], Vasile Parvulescu[4], Jack Winnick[5], Andrey Zagoruiko[2], and Yurii N. Zhukov[6]. (1) Department of Chemical Engineering, University of Patras and FORTH/ICE-HT, Patras GR-26500, Greece, Fax: 30-61-993255, bogosian@iceht.forth.gr, (2) Boreskov Institute of Catalysis, (3) Department of Chemistry, Technical University of Denmark, (4) Department of Chemical Technology and Catalysis, University of Bucharest, (5) School of Chemical Engineering, Georgia Institute of Technology, (6) Byisk Oleum Plant

***ACCEPTED***
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### Abstract

This study describes the outcome of the endeavors for achieving progress in the scientific understanding of processes for $SO_2$ and $NO_x$ emission abatement. The first part will focus on the chemistry and reaction mechanism of $SO_2$ oxidation in vanadium oxide containing molten salt catalysts and NO reduction by ammonia over vanadia-chromia/titania catalysts. These catalytic systems were investigated with respect to the nature of catalytic active sites. Physicochemical and catalytic properties of the molten salt catalysts used for $SO_2$ oxidation were determined and the vanadium complexes formed were characterised by high temperature Raman and UV/VIS spectroscopy. The study furthermore includes *in situ* Raman work on the de$NO_x$ process. The effect of $SO_2$ and humidity in addition to $NO/NH_3/O_2/N_2$ on the surface vanadium species is specially addressed.

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## 441278: Catalytic and electrochemical processes for $SO_2$ and $NO_x$ emission abatement: Part II

## IEC 0 [441278]: Catalytic and electrochemical processes for $SO_2$ and $NO_x$ emission

## abatement: Part II

**Rasmus Fehrmann**[1], Bair S. Bal'zhinimaev[2], Soghomon Boghosian[3], Michael Eriksen[1], Vasile Parvulescu[4], Jack Winnick[5], Andrey Zagoruiko[2], and Yurii N. Zhukov[6]. (1) Department of Chemistry, Technical University of Denmark, Lyngby DK-2800, Denmark, Fax: 45-45883136, rf@kemi.dtu.dk, (2) Boreskov Institute of Catalysis, (3) Department of Chemical Engineering, University of Patras and FORTH/ICE-HT, (4) Department of Chemical Technology and Catalysis, University of Bucharest, (5) School of Chemical Engineering, Georgia Institute of Technology, (6) Byisk Oleum Plant

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## Abstract

The study of catalytic and electrochemical processes for $SO_2$ and $NO_x$ emission abatement is continued in this second part of the presentation which will focus on synthesis, kinetics and *in-situ* EPR-spectroscopic characterization of catalysts for $SO_2$ oxidation and NO reduction by ammonia in connection with catalytical flue gas cleaning. The study includes the development of an electrocatalytical membrane process for $SO_2$ and $SO_3$ removal from power plant flue gases, where the membrane is based on alkali pyrosulfate - vanadium pentoxide molten mixtures. In addition alternative catalysts for $SO_2$ oxidation based on noble metal alloys supported on silica and titania mesoporous materials will be described. Finally, new catalysts for de$NO_x$ - processes based on PILC(Pillared Interlayered Clays)and high surface area vanadia-silica supports will be structurally and kinetically addressed.

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## 442639: Ionic liquids as benign solvents for extraction of astaxanthin and solubilization of chitin

## IEC 0 [442639]: Ionic liquids as benign solvents for extraction of astaxanthin and solubilization of chitin

**Scott K. Spear**[1], W. Matthew Reichert[2], Richard P. Swatloski[2], and Robin D. Rogers[2]. (1) Center for Green Manufacturing, The University of Alabama, Box 870336, Tuscaloosa, AL 35487, Fax: 205-348-0823, sspear@bama.ua.edu, (2) Department of Chemistry and Center for Green Manufacturing, The University of Alabama

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***Topic Selection:*** *Green (or Greener) Industrial Applications of Neoteric Solvents: Ionic and Supercritical Fluids: High Temperature and Other Systems*
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## Abstract

Research priorities laid out in the Vision 2020 Technology Roadmap for Renewable Resources include bioseparations. The separation processing of biomass into a series of distinct chemicals poses many challenges because of the high diversity of chemical components present in living materials. Ionic liquids are an interesting new class of solvents exhibiting solvating abilities of biological materials and biomoecules. This presentation will focus on our exploratory progress to study ionic liquids as novel solvent systems for the extraction of astaxanthin and solubilization of chitin from decalcinated shrimp shells.


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## 445131: Intermission

## 0 [445131]: Intermission

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***Topic Selection:*** *Green (or Greener) Industrial Applications of Neoteric Solvents: Ionic and Supercritical Fluids: High Temperature and Other Systems* ***Preferred Presentation Format:*** *Break*
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## 445132: Discussion

## 0 [445132]: Discussion

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