

The Use of Deep Eutectic Solvents and Ionic Liquids for Metal Recovery, Online Event, 11th of May, 2022



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IOLITEC

Ionic Liquids Technologies GmbH
Germany

Company Facts

IOLITEC

100 % Independent
Heilbronn, Zukunftspark Wohlgelegen
Germany (HQ, RD & Sales)
1'000 m²
Schkopau (Production)
> 3'000 m²

Foundation: 2003

Branch: Special Chemistry / Nanotechnology

Capacity: 2022: > 100 metric tons / year
fast Scale-Up

Customers: > 5'500 (cumulated)

Staff: 25
10 PhD-level chemists
14 highly educated R&D-
and production staff



HQ, Heilbronn, Zukunftspark



Production Site, Schkopau, DOW
Value®-Park („BUNA“)

IOLITEC's Vision:

“Collecting, presenting and disseminate

Data

about

properties of Ionic Liquids

in order to help

scientists and engineers

to design

new processes and devices”

Technologies Applying **Ionic Liquids** – An Overview

STATUS:

- R&D (TRL 1-5)*
- Pilot (TRL 6-9)*
- Commercialized

SOLVENTS

- Organic Chemistry
- Inorganic Chemistry
- Polymer Chemistry

PROCESS-CHEMICALS

- Dissolution of Biomass
- Carbon-Capture
- CO₂ as raw material
- Extracting Agents for Metals

FUNCTIONAL FLUIDS

- Thermal Fluids
- Phase Changing Materials (PCM)
- Sorption Cooling Media
- SILP & SCILL
- Fluids for Gas Scrubbing
- Lubricants
- Hydraulic Fluids

IONIC LIQUIDS PROPERTIES

- Liquid over a Wide T-Range
- Thermal Stability
- Electrochemical Stability
- Low Vapor Pressure
- Non Volatility
- Non Inflammability
- Electric Conducting
- Tunable Miscibility

ADDITIVES

- Antistatic
- Dispersing Agents
- Conductivity Promoters
- Flame Retardants

ANALYTICS

- Electrophoresis
- Solvents for GC-Headspace
- Matrix-Materials for MALDI-TOF-MS
- Solvents for Karl-Fischer Titration
- Media for Protein-Crystallization
- Stationary Phases for GC
- Electrolytes for Sensors

ELECTROLYTES

- Fuel Cells
- Batteries
- Metal Deposition & Electropolishing
- Electrochromic Windows
- Sensors
- Supercaps
- Dye Sensitized Solar Cells

*Ionic Liquids: Next Generation Batteries - **Lithium***

Advantages:

- Faster charging
- Higher energy densities
- Safety

Lithium-Sulfur

Electrolytes, Projects “FIMALIS” & “NEILLSBAT”

Lithium-Oxygen

Electrolytes, Project “AMALIS”



Ionic Liquids Next Generation Batteries - Beyond Lithium



Properties:

- Highly available raw materials: Mg, Al, Zn
- Faster charging
- Higher energy densities
- Safety

Magnesium-Sulfur

Conductive-Salt, Project “MAGSIMAL”

Aluminum-Oxygen

Electrolytes, Project “ALIBATT”

Zinc-Air

Electrolytes, Project “LUZI”

Ionic Liquids: Next Generation Supercapacitors



Advantages:

- Increased Power Density
- Increased Energy Density
- Combining advantages of supercaps (fast charging) with those of batteries (high gravimetric energy density)

Project “ULTIMATE”

Project “HYBACAP”

Project “IES”

Project “NEST”

IOLITEC's Activities in Carbon Capture and CO₂-Utilization



- Removing CO₂ from flue gas
- Reduction of CO₂ to CO and transformation into chemicals

Pilot

EU Project "RECODE"

Removing CO₂ from flue gas
to produce formic acid / glycine

EU Project "DIACAT"

Photoelectric transformation of CO₂ into chemicals
(Methanol, formic acid...)

EU-Project "IOLICAP"

Removing CO₂, post combustion capture (PCC) Project

"SUNCOCHEM"

CO₂ capture from air/exhaust gases from the Chemical Industry
and its selective concentration in ILs

Ionic Liquids: Storing and Transporting Heat

Thermal Fluids

- High performance thermal fluids for applications where an ultralow vapor-pressure combined with good head-transport-properties is essential

Sorption-Cooling-Media

- Replacing corrosive and comparable expensive Lithium Bromide
- Ionic Liquids remains always in the liquid state

Phase Changing Materials

- Storing heat in hydrocarbon-free, safe materials



Ionic Liquids: Lubricants & Additives for Lubricants



Properties:

- Ultra-low vapor pressure
- Strong interaction with surfaces (= protection)
- Conductivity

Ionic Liquid-based base oils

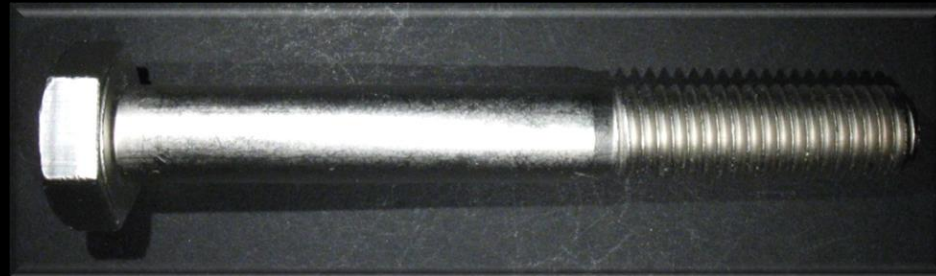
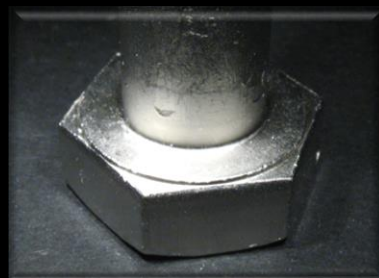
- Ultra high performance wherever surfaces have to be protected
- Vacuum applications

Commercialised!

Additives

- Extreme pressure additives, reducing friction & wear
- Enhancing conductivity

- no structural limitations of substrate
- short deposition times also for complex substrates
- deposition at room temperature possible
- no danger of explosion, non inflammable electrolyte
- conditions:
45-55 mA/cm², 25 °C, 20 min: 10 µm
- IOLITEC has developed recycling processes for used electrolytes („Rent-an-Ionic-Liquid“)



Ionic Liquids: Other Applications

Solvents

- Organic Reactions
- Inorganic Reactions
- Polymerization
- Catalysis (SILP, SCILL etc.)

Bio-Based Raw Materials and Recycling

- Dissolving Cellulose, Lignin or Chitin
- Selective extraction of metals

Reagents for Analytical Applications

- Solvents for GC headspace
- Solvents for the crystallization of proteins
- Electrolytes for sensors

Additives

Plastics, Rubbers, Glues etc.

Pilot

Commercialised!

Commercialised!



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