

Ionic Liquids Properties and Applications Training Course

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Overview

Ionic Liquids Properties and Applications Training Course is a one-week professional course for chemists, chemical engineers, materials scientists, process developers, laboratory specialists, and sustainability professionals who leave with an Ionic Liquid Selection and Assessment Workbook. Participants connect ion structure, thermophysical and transport properties, data quality, stability, handling, application screening, recovery, safety, and sustainability. The course turns broad material claims into evidence-based selection decisions. Agile Leaders Training Center presents ionic liquids through property-led engineering and lifecycle assessment.

Who Should Attend

- Functions responsible for selecting solvents and functional fluids
- Process teams responsible for separations, extraction, catalysis, or reaction media
- Materials and electrochemistry teams responsible for electrolytes and functional systems
- Laboratories responsible for property measurement, purity, and data quality
- Sustainability functions responsible for hazard, lifecycle, recovery, and disposal decisions

The course assumes participants can interpret chemical structures, units, and basic property data, and it leaves out proprietary synthesis recipes, scale-up authorization, and product certification.

Departments and Industries

The course supports departments and industries evaluating ionic liquids for research, development, and process use.

- Chemicals, petrochemicals, solvents, and process technology
- Energy storage, electrochemistry, catalysis, and carbon management
- Pharmaceuticals, biotechnology, and advanced materials
- Research laboratories, product development, and analytical services
- Process engineering, safety, environmental, and sustainability teams

Learning Objectives

By the end of this course, participants will be able to:

- Analyze cation-anion structure and property relationships
- Use thermophysical and transport data with uncertainty evidence
- Compare ionic liquids for solvent, separation, catalytic, and electrochemical uses
- Evaluate water, impurities, compatibility, and stability effects
- Build recovery, reuse, safety, and lifecycle screening criteria
- Prioritize candidates through a documented selection workflow

Course Agenda

Day 1: Define Ionic Liquid Families and Requirements

- IUPAC Ionic Liquid and Room-Temperature Class Definition Map
- Cation, Anion, Functional Group, and Naming Reference Sheet
- Application Requirement and Constraint Register
- Structure-Property Hypothesis Worksheet
- Ionic Liquid Selection and Assessment Workbook Structure

Day 2: Evaluate Properties and Data Quality

- Melting, Glass Transition, Density, and Heat Capacity Matrix
- Viscosity, Conductivity, Diffusivity, and Surface Tension Review
- Polarity, Solubility, Miscibility, and Phase-Behavior Map
- NIST ILThermo Property, Purity, Method, and Uncertainty Record
- Water Content, Impurity, and Batch-Variability Sensitivity Check

Day 3: Screen Applications and Process Fit

- Solvent and Reaction-Medium Selection Scorecard
- Liquid-Liquid Extraction and Separation Equilibrium Review
- Catalysis and Gas-Solubility Application Matrix
- Electrolyte Conductivity and Electrochemical Window Checklist
- Materials Processing and Functional Additive Decision Sheet

Day 4: Assess Stability Safety and Sustainability

- Thermal Decomposition and Chemical Stability Test Plan
- Equipment, Seal, Metal, Polymer, and Moisture Compatibility Register
- Exposure, Toxicity, Ecotoxicity, and Environmental Fate Screen
- Recovery, Purification, Reuse, and Loss-Control Flow Diagram
- Lifecycle Tradeoff and Sustainable Design Decision Matrix

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Day 5: Ionic Liquid Selection Practice

- Exercise: Compare Ion Families Against a Property Target
- Exercise: Review ILThermo Data and Uncertainty
- Exercise: Screen an Ionic Liquid for a Process Application
- Exercise: Evaluate Stability, Safety, Recovery, and Lifecycle Evidence
- Capstone Exercise: Complete the Ionic Liquid Selection and Assessment Workbook

Practical Exercises

The course uses suggested activities based on structures, property tables, experimental metadata, application cases, and lifecycle evidence.

- Suggested activity: connect ion-pair choices with viscosity, conductivity, solubility, and stability needs
- Suggested activity: evaluate property data for purity, method, uncertainty, and transferability
- Suggested activity: compare ionic-liquid candidates for separation, catalysis, or electrochemistry
- Suggested activity: document safety, recovery, reuse, environmental, and decision uncertainties

FAQs

Who suits ionic liquids properties and applications training, and what does it assume?

Ionic liquids properties and applications training suits chemistry, process, materials, laboratory, and sustainability functions. It assumes participants can interpret chemical structures, units, and basic property data.

How does ionic liquids training differ from general solvent-selection training?

Ionic liquids training focuses on ion-pair design, unusual thermophysical and transport properties, water sensitivity, stability, recovery, and application-specific tradeoffs. General solvent training covers a wider range of molecular solvents and conventional selection criteria.

What properties matter when selecting an ionic liquid?

Selection may require melting behavior, viscosity, density, conductivity, polarity, solubility, phase behavior, thermal and chemical stability, water sensitivity, compatibility, toxicity, recovery performance, and data uncertainty.

Why do purity and water content matter for ionic liquids?

Purity and water content can change viscosity, conductivity, phase behavior, stability, electrochemical performance, and reproducibility. Selection evidence should record sample condition, measurement method, uncertainty, and handling history.

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Are ionic liquids automatically safe and sustainable?

Ionic liquids are not automatically safe or sustainable. Responsible assessment considers synthesis inputs, exposure, toxicity, environmental fate, degradability, mobility, recovery, reuse, energy demand, losses, and application performance across the lifecycle.

Conclusion

Participants take back an Ionic Liquid Selection and Assessment Workbook linking ion structure, properties, data quality, applications, stability, safety, recovery, and lifecycle evidence. The workbook replaces broad material labels with traceable selection criteria. It supports research and process decisions while approved laboratory methods, safety procedures, and competent technical review remain governing.

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