

## A COMPREHENSIVE REVIEW OF GREEN SOLVENTS AND THEIR APPLICATIONS

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### INTRODUCTION

**Solvents play a vital role** in the chemical process industry. **However, it is carcinogenic and can cause toxicological effects.** This demands a reevaluation that accounts for their environmental performance, cost, and safety in industrial processes.

**Green solvents** as an alternative to traditional petrochemical solvents can help promote safety, health, sustainability, and reduce environmental degradation.



### RESEARCH GAPS

- **Polymer dissolution** in paints and coatings
- **Insufficient toxicological evidence** on environmental benefits of green solvents.
- **Additional analysis** of bio-based solvents before being classified as green.
- **Lack of predictive models** for DESs and supercritical fluids (new technology)

### FUTURE OUTLOOKS

- **Prioritization** of sustainable synthesis methodology
- **Expansion of reliable predictive models**
- Focus on **comprehensive toxicological evidence** for sustainability .

## LITERATURE RESULTS

#### Bio-based Solvents

Solvents that are bio-based are rendered from resources using biomass conversion techniques to produce fuels, power, and chemicals.

#### Ionic Liquids

Ionic Liquids (ILs) show potential substitute for traditional volatile organic solvents because of their low melting points, advantageous environmentally and technologically.

#### Deep Eutectic Solvents

DESs are plant-based compounds which are called NADES, displaying thermal stability and adjustable polarity that position them as promising alternatives to VOCs.

#### Petroleum Alternatives

Ethanol, 2-MeTHF, and terpenes are invaluable as petroleum alternatives since they provide the same efficiency and quality as petroleum-based solvents without the toxicity.

#### Liquid Polymers

Liquid polymers have been shown to be biodegradable and environmentally friendly substitutes for solvents used for carbon capture.

#### Fatty Acid Ester

Fatty acid ethyl esters (FAEE) are promising green solvents, demonstrating exceptional properties such as renewability, environmental friendliness, and non-toxicity.

#### Supercritical Fluids

Supercritical fluids (SCFs) exhibit unique properties of both gases and liquids when substances surpass their critical temperature and pressure, making them desirable green solvents.

#### Terpenes

Terpenes are natural hydrocarbon bio-solvents recognized for their environmental safety, naturally found in citrus fruits like D-limonene which is low in toxicity and versatile.