



“Green” Replacement for Industrial Applications of Polar Organic Solvents

UNIVERSITY OF
COLORADO

TECHNOLOGY
TRANSFER
OFFICE

Boulder + Colo. Springs
4740 Walnut Street
Suite 100

Campus Box 589
Boulder, CO 80309

(303) 492-5647

Denver + Anschutz
Medical Campus
12635 E. Montview Blvd
Suite 350
Campus Stop F411
Aurora, CO 80045

303-724-0221

www.cu.edu/techtransfer

Background

Polar organic solvents are commonly used in cleaning, reactions, and processing in many industries. Today these solvents are known to be volatile, hazardous to health, toxic in the environment, and flammable, with no comparable alternatives. These toxic attributes make polar organic solvents very hard to work with, and the harmful effects of these volatile compounds require that expensive procedures, equipment and environmental, health, and safety controls be in place at all times to ensure employee safety. These compounds are used as gels, solutions, films, membranes, compositions, and other materials containing polymerized and/or non-polymerized room-temperature ionic liquids (RTILs). The market for green alternatives is increasing, and simple environmental changes such as switching to green solvents may become a large part of this global change, revolutionizing the processes of industries dependant on these compounds.

Technology

A research team at the University of Colorado led by Douglas Gin has developed new RTILs that are “green” replacements for polar organic solvents. This new green solvent is non-volatile, has a high thermal range of operation, and can be mixed with water in specified ratios to control the properties of the preferred solvent solution. These three advantages set this compound apart from traditional solvents, and translate into both environmental improvements and cost savings. The properties of RTILs make them useful in catalysis, gas separation and as antistatic agents. The antistatic property is important because it prevents problems such as attracting dirt or dust, causing materials to repel or stick to each other, or creating a spark through static electricity that could cause a fire or explosion.

This solvent is not only environmentally friendly to use, it is also environmentally friendly to produce. It can be used alone, or it can be added to water to yield varying solvent characteristics to control thermal properties and reactivity. (Thus, this solvent could improve some industrial reactions, but reduce the efficiency of others.) There is a distinct cost advantage in being able to use this compound with water; the mixture could yield a cheaper greener polar solvent with valuable thermal properties.

The main advantage however, is the non-volatility of this solvent. Current polar organic solvents are hard to work with because of their volatile and toxic nature. Expensive environmental, health, and safety controls, procedures, and equipment must be in place at all times to work with such volatile compounds. This alternative eliminates the need for stringent controls and equipment, and makes the work environment safer for employees. The lower volatility can lead to more energy intensive separation of the solvent; however, this is something that should be considered when moving to this alternative.

Advantages

- ⇒ Non-volatile at room temp
- ⇒ Non-toxic
- ⇒ Mixing with water yields greater control of solvent properties
- ⇒ Environmentally friendly to use and produce

IP Status:
Patent pending;
available for
exclusive or non-
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Case Manager:
MaryBeth Vellequette
[Email](#)
Ref # CU2249B

Key Document



[Imidazolium-Based Room-Temperature Ionic Liquids, Polymers, Monomers, and Membranes Incorporating Same](#). PCT filed July 23, 2010.