

# NOVEL POROUS ORGANIC POLYMERS FOR AMMONIA ADSORPTION

Tech ID: 23785 / UC Case 2014-086-0

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,987,583	06/05/2018	2014-086

## BRIEF DESCRIPTION

Ammonia is used in many industrial and commercial applications, for example in the manufacture of fertilizers and cleaners. However, ammonia is toxic at high concentrations and, therefore, safe storage and transportation of ammonia is required. In addition, trace amounts of ammonia in the atmosphere contaminate and interfere with certain industrial processes, such as semiconductor fabrication, which requires ultra-pure air. Proper ammonia management includes the adsorption of the gas under each of these pressure regimes: high-pressure adsorption for safe storage and transportation and low-pressure adsorption for the removal of trace contaminants from the ambient air. Current methods of adsorption include simple salts, such as  $MgCl_2$ , but these are not efficient for low-pressure adsorption and furthermore their ammonia cycle is inefficient, requiring significant heat exchange and large changes in volume.

Investigators at UC Berkeley have developed a novel polymer for ammonia adsorption that uses acidic materials placed in a spatial arrangement that allows for cooperative adsorption. This not only increases the efficiency of adsorption but also is effective at both high-pressure and low-pressure ammonia adsorption, resulting in multiple applications of the technology.

## SUGGESTED USES

- » Air purification of ammonia, for example for semiconductor fabrication
- » Personal protective equipment for adsorption of chemical agents
- » Safe on-board automobile storage of ammonia, for example in emission reduction technologies
- » Safe storage and transportation of ammonia

## ADVANTAGES

- » Can be applied to both high- and low-pressure ammonia adsorption
- » More efficient (high capacity) adsorption than traditional methods due to cooperative nature
- » Low heat exchange and volume changes of adsorbing material during ammonia cycling
- » Superior stability of material
- » Tolerates long-term ammonia exposure and multiple adsorption/desorption cycles

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## INVENTORS

- » Long, Jeffrey R.

## OTHER INFORMATION

### KEYWORDS

- Ammonia Adsorption; Air Purification; Polymer; Acidic material

### CATEGORIZED AS

- » **Environment**
- » Other
- » **Materials & Chemicals**
- » Polymers
- » **Semiconductors**
- » Processing and Production
- » **Transportation**
- » Other

### RELATED CASES

2014-086-0

## PUBLICATION

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<http://pubs.acs.org/doi/abs/10.1021/ja4105478>

### ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Next-Generation Metal-Organic Frameworks With High Deliverable Capacities For Gas Storage Applications
- ▶ Porous Polymer Networks For Per- And Poly-Fluoroalkyl Substance Separations
- ▶ Selective Carbon Monoxide Uptake via Metal Carbanion Functionalized Metal-Organic Frameworks
- ▶ Structures and Apparatus using Three-Dimensional Linked Networks
- ▶ Gas Separations With Redox-Active Metal-Organic Frameworks
- ▶ Metal-Organic Frameworks For Aromatic Hydrocarbon Separations
- ▶ Isothermal Carbon Capture And Release Of Carbon Dioxide With Molecular Polyamines
- ▶ Selective Nitrogen Adsorption Using a Vanadium Metal-Organic Framework
- ▶ Metal-Organic Frameworks for H<sub>2</sub> Adsorption and Drug Delivery
- ▶ Separation Of 1-Butene From 2-Butene Using Framework Open Metal Sites
- ▶ Redox-Active Metal-Organic Frameworks for the Catalytic Oxidation of Hydrocarbons
- ▶ Phase Change Adsorbents For Storage And Separation Applications



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