



# A process to make ultra-high purity urea at low cost by using enzymes

**Low cost enzyme-processed ultra-high purity urea for high-grade fertilizer, diesel emissions fluid and pharmaceuticals**

**IP Status:** PCT Application Filed

## Applications

- Diesel Emission Fluid (DEF)
- Fertilizer
- Additive in industrial, consumer, and medical products

## Key Benefits & Differentiators

- **Ultra-high purity:** Purity of Urea achieved using this process is greater than 99.99% purity, which cannot be achieved in any other cost-effective way.
- **Reduced cost:** Reduces the cost of Ultra-Low Biuret Urea (ULBU) by 2-2.5 folds
- **Ease of production:** Production of enzyme can be scaled up readily.
- **Ease of distribution:** Enzymes are safe and clean to use.
- **Ease of Use:** Purification step is simple. Enzymes can be added directly to diesel emission fluid (DEF) or treat fertilizer in dry or liquid form..

## Reduced cost ultra-high purity urea

Low-biuret urea is required by regulations for diesel emission fluid (DEF) and for certain crops in agriculture. Low-biuret urea is significantly more expensive than conventional urea. This premium can be realized using inexpensive urea upgraded by enzyme treatment. The enzyme developed here is shown to work directly by adding to DEF fluid during manufacture. A specialized enzyme has been developed that can work in the high urea concentrations of DEF. The enzyme can be used directly or in immobilized form for removal and reuse. The enzyme can be added directly to fertilizers in liquid form or in a dry form where it acts upon dissolution or in the field. The proposed technology uses an enzyme that converts biuret into the desired material urea itself to increase yield and produce highly purified (>99.99%) urea. The product can be used for ultra-high-purity applications such as pharmaceutical and consumer products.

Prof. Lawrence Wackett, PhD. at the University of Minnesota has developed a novel method that transforms biuret into urea, increasing both yield and purity of the Urea. The method entails using a specific biocatalyst enzyme. The high levels of purity attained have not been achieved by any other process. The enzymes are low-cost and can be produced on large scale. Urea used for diesel fluids must contain low levels of biuret, as the latter interferes with the catalyst in NOx reductions systems for diesel engines. Multiple crops such as cotton, avocados, and citrus fruits are susceptible to a higher percentage of biuret. High-grade urea is also utilized in cell culture and protein methodologies, particularly pertaining to human pharmaceuticals. Market research estimating the enzymatic treatment applied to 1% of urea projects a \$500 million market.

## Phase of Development

## Technology ID

2020-129

## Category

Engineering & Physical  
Sciences/Chemicals  
Engineering & Physical  
Sciences/Sustainable Technology  
Life Sciences/Industrial Biotech  
Life Sciences/Pharmaceuticals  
Agriculture & Veterinary/Ag  
Biotechnology

## Learn more



**TRL: 3-4**

Testing of enzymes converting biuret to Urea has been performed. Further testing at a larger scale and application studies need to be done.

**Desired Partnerships**

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

**Researchers**

- [Lawrence Wackett, Ph.D.](#) Professor, Department of Biochemistry, Molecular Biology

**References**

1. Robinson, Serina L., Jonathan P. Badalamenti, Anthony G. Dodge, Lambros J. Tassoulas, and Lawrence P. Wackett(12 March 2018) ,  
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