

# METHOD FOR REDUCTION OF CARBOXYLIC ACIDS WITH AMMONIA BORANE CATALYZED BY TITANIUM TETRACHLORIDE

**Water-mediated, solvent-dependent synthesis of amine-boranes offers a green, low-cost, scalable route for reagents in organic and materials chemistry.**

Researchers at Purdue University have developed a novel method of reducing carboxylic acids to alcohols, a process that has multiple pharmaceutical and fine chemical applications. The process of carboxylic acid reduction is typically quite challenging and hazardous as many reducing agents are air and moisture sensitive, leading to a potentially explosive reaction. Less hazardous methods—such as using borane-amines—are underexplored, creating a need for methods which employ less hazardous reducing agents while maintaining a robust substrate scope.

Purdue researchers have identified an air and moisture stable reducing agent that successfully converts a wide variety of carboxylic acids to alcohols at room temperature while posing less of an explosive liability. This method is tolerant of amides, nitriles, esters, halogens, alcohols, and nitro groups. This technology is an excellent alternative for difficult carboxylic acid reductions and for safer synthesis in pharmaceutical and fine chemical applications.

**Technology Validation:** This technology underwent a substrate scope screening identifying the tolerated functional groups. Nuclear magnetic resonance was utilized to characterize the compound and determine the purity.

## Advantages:

- Air and moisture stable
- Robust substrate scope
- High percent yield compared to other methods

**Technology ID**  
2023-RAMA-70052

## Category

Chemicals & Advanced  
Materials/Specialty &  
Performance Chemicals  
Pharmaceuticals/Pharmaceutical  
Manufacturing & Methods

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**Applications:**

-Pharmaceutical agents

-Fine chemicals

**TRL:** 2

**Intellectual Property:**

Provisional-Patent, 2023-11-08, United States

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