

# Primary Amine Synthesis using Novel Iridium Complex (628)

*An Efficient High-Yield Amine Catalysis using Ammonia Water*

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## Description

Researchers at Kyoto University have developed novel iridium catalysts for high-yield synthesis of primary amines that requires only alcohol and ammonia water as chemical raw material.

Organic amine synthesis ammonia as a nitrogen source has been researched widely to date. However, available methods have various problems for industrial applications.

For example, amine synthesis using ruthenium catalyst uses ammonia gas and/or liquefied ammonia liquid, thus needs special equipments. Other method using ammonia gas/ammonia dissolved in organic solvent with transition metals such as halogen-substituted aryl compound produces unnecessary byproducts such as halide salt thus lacks in atom efficiency and in harmony property with environment. In addition, a reductive amination method using ammonia and aldehyde with transition metal catalyst requires high pressure hydrogen gas as a reductant, which makes the method unsafe and unpractical.

The innovation provides for a novel synthesis capable of overcoming these problems. According to the new method using the novel iridium catalysts, inexpensive and available ammonia water is used as a nitrogen source and primary amines are obtained in yield as high as 83%. In addition, no byproduct is produced thus is safe and convenient for a low cost manufacture of drugs and chemical products.

## Advantages

- High yield synthesis of primary amine (<83%)
- Low cost synthesis thanks to the use of inexpensive and available nitrogen source
- Free from hazardous byproducts

## Market

We are seeking a company to license the technology for its industrial applications.

### Potential Applications

- Intermediate for medicines
- Flavor material
- Agrochemical
- Resin
- Development of functional materials (Anti-static additives/lubricants/water treatment)
- Catalyst for research purpose

## Research Status

Several types of catalysts are developed and conditions for primary amines synthesis are optimized.

- Amount of iridium catalyst
- Amount of ammonia liquid
- Time
- Temperature.

## Intellectual Property

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## Comparison with Available Methods

		Nitrogen Source	Safety	Manufacturing Cost
Available Method	Coupling reaction with halogen-substituted aryl compounds	× Ammonia gas or ammonia dissolved in organic solvent	× Produces hazardous halide salt	Medium (Equipment for handling nitrogen source)
	Reductive amination	✓ Ammonia	× Use of high pressure hydrogen gas	High (Use of reductant)
	Ruthenium catalyst	× Ammonia gas or liquefied ammonia	✓	Medium (Equipment for handling nitrogen source)
Innovation		✓ <b>Ammonia water</b>	✓	Medium (Ongoing optimization of conditions)

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