Conversion of Cyclic Amines into Lactams for Synthesis of Nylons and Other Polymers

APPLICATION AREAS
Synthesis of Nylons and Other Polymers

ABSTRACT
Lactams are used for a wide variety of commercial applications, such as precursors for the production of solvents, nylons, and other polymers. Caprolactam is a particularly important lactam that is used as a precursor for Nylon-6, of which millions of tons are sold each year. However, the traditional commercial process for production of caprolactam uses highly corrosive sulfuric acid and generates ammonium sulfate as a by-product. So-called "green" methods for production of caprolactam give relatively high yields, but require expensive high pressure equipment. To overcome these drawbacks, ISU and Ames Laboratory researchers have developed a process for the conversion of cyclic amines (typically 5-, 6-, and 7-membered rings) into lactams that can be used for the synthesis of nylons and other commercially important polymers. This process uses Au/SiO₂ to catalyze the reaction of cyclic amines with oxygen at low pressures and uses starting materials that do not require lengthy syntheses.

BENEFITS
- Enables synthesis of lactams used for a variety of commercial applications
- Process does not use highly corrosive sulfuric acid or generate ammonium sulfate by product
- Does not require high pressure equipment
- Uses different starting materials than traditional routes to lactams

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INTELLECTUAL PROPERTY STATUS (July 2012)
Patent issued: US Patent No. 8,212,027

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