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High Yield Ammonia Production

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Improved Ammonia Synthesis

An ammonia synthesis process has been developed that has conversion rates greater than 90%, as compared to conversion rates of 20% with the standard Haber-Bosch process. This method does not require the downstream separation and recycling that are currently limiting factors in creating plants with small capital investments. The improved process includes the addition of magnesium chloride ($MgCl_2$) as an absorbent that optimizes the kinetics of ammonia production. This inexpensive additive absorbs ammonia from the gas phase, allowing the reaction to continue at a high rate without reaching equilibrium and improves yield in reactors that currently use the Haber-Bosch process. This technique may allow distributed small scale ammonia production as opposed to current methods that require one consolidated plant.

Small Scale Ammonia Production

Ammonia is used primarily in fertilizers, coolants and fuel, and has drastically altered agriculture in the past century. The Haber-Bosch process has been predominantly used to make ammonia, and involves combining nitrogen and hydrogen gas under high pressures and temperatures in large, capital-intensive plants. In order to be highly economical, tremendous capital and energy costs must be incurred to build and sustain a plant large enough to supply multiple states with ammonia. The efficiency of ammonia production must be increased significantly before it can be synthesized on a small scale while remaining cost-effective.

BENEFITS AND FEATURES OF HIGH YIELD AMMONIA PRODUCTION:

- Improves yields to upwards of 90%, as compared to 20% currently
- Does not require large investments in capital
- Facilitates distributed ammonia production

Phase of Development Proof of concept. Process demonstrated on laboratory scale

Researchers: Alon McCormick, PhD Professor, Chemical Engineering and Materials Science, College of Science and Engineering