

## A novel strategy for ammonia production using yeast

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### Abstract:

Ammonia, with a worldwide production capacity of 235 million tonnes, is one of the main chemical commodities produced, extensively used as fertiliser with growing interest as an energy storage vector. The conventional Haber-Bosch synthesis requires about 2% of total world's energy, which is commonly derived from fossil fuels, thus generating high levels of CO<sub>2</sub> emissions. To achieve a carbon-free society, sustainable routes for ammonia production are needed.

Among the biological approaches, some bacteria and yeasts have already been used to produce ammonia from biomass, respectively, by metabolic engineering and by displaying an amino-acid-catabolizing enzyme on the cell surface. In our laboratory, we investigated the natural ability of yeasts to release ammonia, opening new process possibilities. We worked to validate the ammonia release and further increase this feature. As a matter of fact, using a *Saccharomyces cerevisiae* strain, yeast background and protein-based medium composition were evaluated, and an adaptive laboratory evolution strategy was successfully adopted to promote an enhanced and natural nitrogen release metabolism. Moreover, bioreactor cultivations have been developed. The results showed promising extracellular ammonia accumulation which could have a valuable biotechnological application.

The final goal of this project will be to create a cell factory able to valorise different waste biomasses for a renewable and sustainable process.