

NTU team finds greener, cheaper way of producing fertiliser

Urea-making method uses less energy, does not need high heat, can be done in backyard

Osmond Chia

Found naturally in the urine of mammals, urea is used as a fertiliser in many farms to produce food for half of the world's population.

But mass production of the compound has been widely criticised, because the process at industrial plants leaves a high carbon footprint that damages the environment.

The manufacturing of urea alone is responsible for 2 per cent of global energy consumption, and this figure is set to rise amid an increase in global food demand.

To pave the way for a more sustainable agriculture industry, a team of scientists from Nanyang Technological University (NTU) has developed a greener and cheaper way of producing urea.

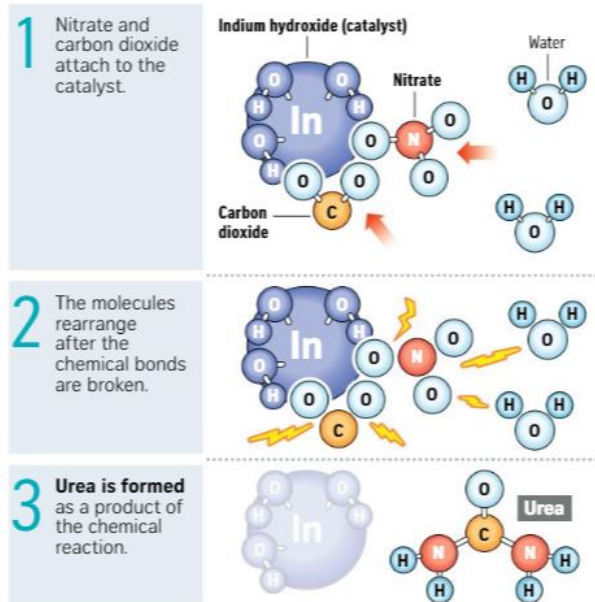
This method uses electricity to trigger chemical reactions in a solution to create the compound. Reactions occur at room temperature and can take place on large and small scales, even in a glass jar.

This is in stark contrast to the process in high-pressure chambers at industrial plants. The chambers go up to 500 deg C, generating heavy carbon emissions.

NTU's method uses less energy and does not require high heat. Ni-

How the fertiliser compound is made

Urea, a natural product found in the urine of mammals, is also an essential compound used in mass-produced industrial fertilisers. Researchers at NTU have developed a more sustainable and energy-efficient method to greatly improve the existing urea production process.



trate instead of the usual ammonia is used to combine with carbon dioxide in the air, and indium hydroxide serves as a catalyst.

"This is a room temperature-based process, with some wires. It is much, much cheaper. With high pressure, you need costly equipment that is very strong to with-

stand certain temperatures," said NTU's Professor Alex Yan, co-lead author of the study, which was published in peer-reviewed scientific journal *Nature Sustainability* last month.

"(With the new method, there is) less energy consumption and carbon emissions," he added.



Professor Alex Yan (standing) with a teammate, working on producing urea in a lab at Nanyang Technological University. Prof Yan hopes the team's cheaper, easier method will lead industry players to change their current production process, which is heavily reliant on fossil fuels. PHOTO: NTU

The new method's urea yield is 53.4 per cent, he said. Industrial production methods yield about 90 per cent.

Still, Prof Yan hopes the cheaper, easier method will lead industry players to change their current production process, which is heavily reliant on fossil fuels.

"You can do this set-up anywhere - any farmer can create urea with this method. It is something that can be used in a backyard," he said.

While the study is not the first of its kind, the method has the highest production yield and efficiency so far, said Prof Yan, who teaches at NTU's School of Materials Science and Engineering.

Agricultural sciences expert Norman Teo Zhi Wei, a research fellow at the National University of Singapore's Department of Biological Sciences, said the new method can

greatly reduce the amount of energy needed in urea production and lead to lower pollution levels.

But he added that the technology will first have to be scalable to manage production on a massive scale. Raw materials needed for the reaction, such as nitrate, will also have to be sourced in a sustainable manner.

Prof Yan said the team will work to increase the patented method's efficiency rate to at least 80 per cent and develop ways to bring it to the industry in a few years.

He believes this new approach will be increasingly significant if countries begin to clamp down on emissions in agriculture.

The team hopes to use solar panels to power the production to make it completely sustainable, he said.

osmondc@sph.com.sg