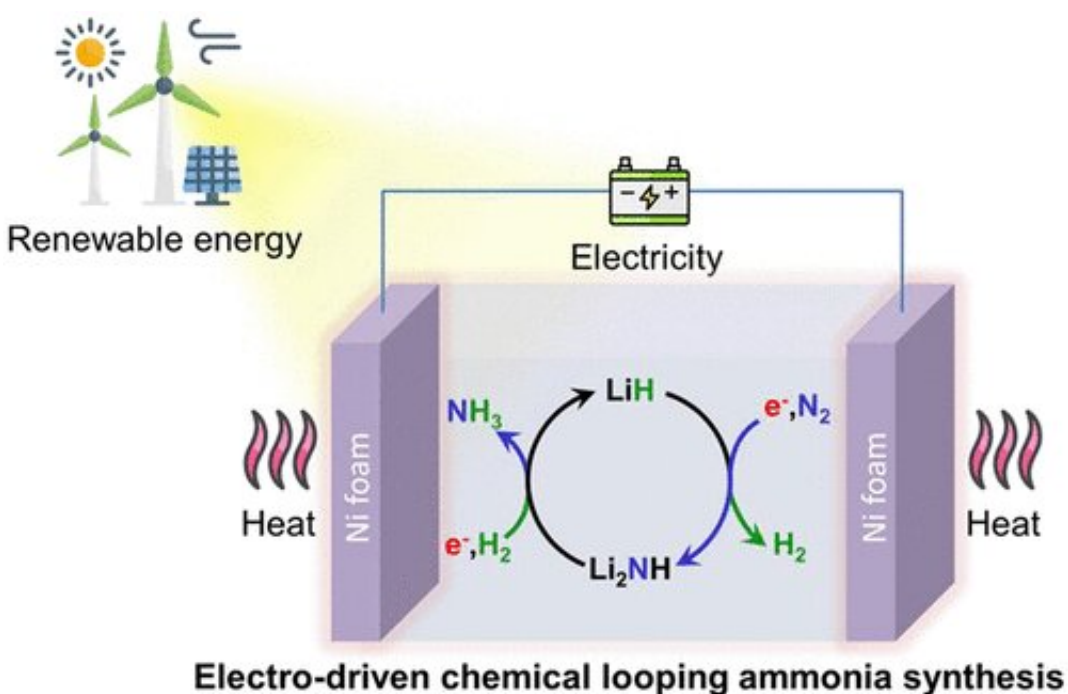


Researchers propose electrodriven chemical looping ammonia synthesis mediated by lithium imide

March 16 2023, by LI Yuan



Graphical abstract. Credit: *ACS Energy Letters* (2023). DOI: 10.1021/acseenergylett.2c02730

Ammonia (NH_3) is a promising energy vector for the storage and utilization of renewable energies. Artificially synthesizing NH_3 from its elements requires harsh reaction conditions (400–500 °C, 10–30 MPa) because N_2 is inert and nonpolar with a strong $N\equiv N$ bond. The synthesis

of NH_3 under mild conditions is still challenging.

Recently, Assoc. Profs. Cao Hujun, Gao Wenbo and their [collaborators](#) from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS) have proposed a new process for [ammonia](#) synthesis using Li_2NH as an N carrier via the method of electrodriven chemical looping.

This study was published in *ACS Energy Letters*.

The researchers carried out this electrodriven chemical looping ammonia synthesis (ECLAS) in a LiCl-NaCl-KCl eutectic electrolytic cell using a nickel foam as electrode.

Electric energy input not only improved the hydrogenation rate of Li_2NH , but also promoted the nitrogen fixation reaction of LiH. In addition, the average ammonia production rate of this ECLAS process was nearly eight times higher than that of the thermal-driven CLAS process.

They found that the process contained two [electrochemical reactions](#), one was the nitridation of LiH to form Li_2NH , and the other was the hydrogenation of Li_2NH to produce ammonia and regenerate LiH. This was different from the reported Li_3N -mediated electrochemical ammonia synthesis process, which included three-step reactions: Li ion was reduced to Li, Li fixed dinitrogen to form Li_3N , and Li_3N was then protonated to produce ammonia and Li^+ .

"This ECLAS process has a low theoretical operating voltage than the Li_3N -mediated electrochemical [ammonia synthesis](#) process, and it could work under as low voltages as 2.0 V," said Cao.

More information: Sheng Feng et al, Electrodriven Chemical Looping

Ammonia Synthesis Mediated by Lithium Imide, *ACS Energy Letters* (2023). [DOI: 10.1021/acseenergylett.2c02730](https://doi.org/10.1021/acseenergylett.2c02730)

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