Hydrogen energy storage dili

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Dedicated wind-sourced hydrogen (H2) can decarbonize industries but requires thousands of tonnes of H2 storage. Storing H2 as methylcyclohexane can outcompete alternative aboveground solutions with modest effects on delivery costs.

Direct capture and conversion of CO2 from the atmosphere is appealing to realize negative emissions but challenging due to the inherent low CO2 concentration. Here, authors report a proof-of-concept hybrid electro-thermochemical device for direct CH4 production from the air.

This work focuses on clathrates, ice-like structures incorporating H2 molecules in their cages. In bulk, pure H2 clathrates only form in harsh conditions. Here, the formation of pure H2 clathrate hydrate in confined space of a porous silica is demonstrated at much reduced pressures compared to the bulk H2 clathrate.

Hydrogen spillover is typically associated with reducible metal oxides and considered relevant for various hydrogen-related technologies. Here, the authors demonstrate that a non-reducible MgO doped with heteroatom Al enables hydrogen spillover similarly to reducible metal oxides.

Driven by carbon neutral targets, proton exchange membrane water electrolysis is becoming a hot technology due to its capability to convert fluctuating power into green hydrogen. Unfortunately, despite tremendous resources invested in fundamental research, only very few research outcomes have successfully translated into the development of industrial-scale electrolysers.

Injecting hydrogen into subsurface environments could provide seasonal energy storage, but understanding of technical feasibility is limited as large-scale demonstrations are scarce. Now, field tests show that hydrogen can be stored and microbially converted to methane in a depleted underground hydrocarbon reservoir.

Electrochemical methods are emerging as potential ways to electrify the production of ammonia (NH3). Now, researchers have discovered a copper-tin electrocatalyst that can efficiently and selectively achieve high production rates of ammonia from nitric oxide (NO) feedstocks, marking a key step forward in decarbonizing ammonia synthesis.

Photocatalytic hydrogen peroxide formation is an advancing field with various approaches motivated by the promise of a green oxidant and energy carrier for a sustainable future. An assessment on quantification

methods, sacrificial agents and best practices is provided to avoid false positives and support progress in the field.

Jos? Miguel Berm?dez Men?ndez, energy technology analyst on hydrogen and alternative fuels at the International Energy Agency (IEA), talks to Nature Energy about the IEA"s Hydrogen Projects Database, which was last updated in October 2022.

Ammonia has been proposed as a shipping fuel, yet potential adverse side-effects are poorly understood. We argue that if nitrogen releases from ammonia are not tightly controlled, the scale of the demands of maritime transport are such that the global nitrogen cycle could be substantially altered.