Synergistic catalysts for high-efficiency hydrogen storage

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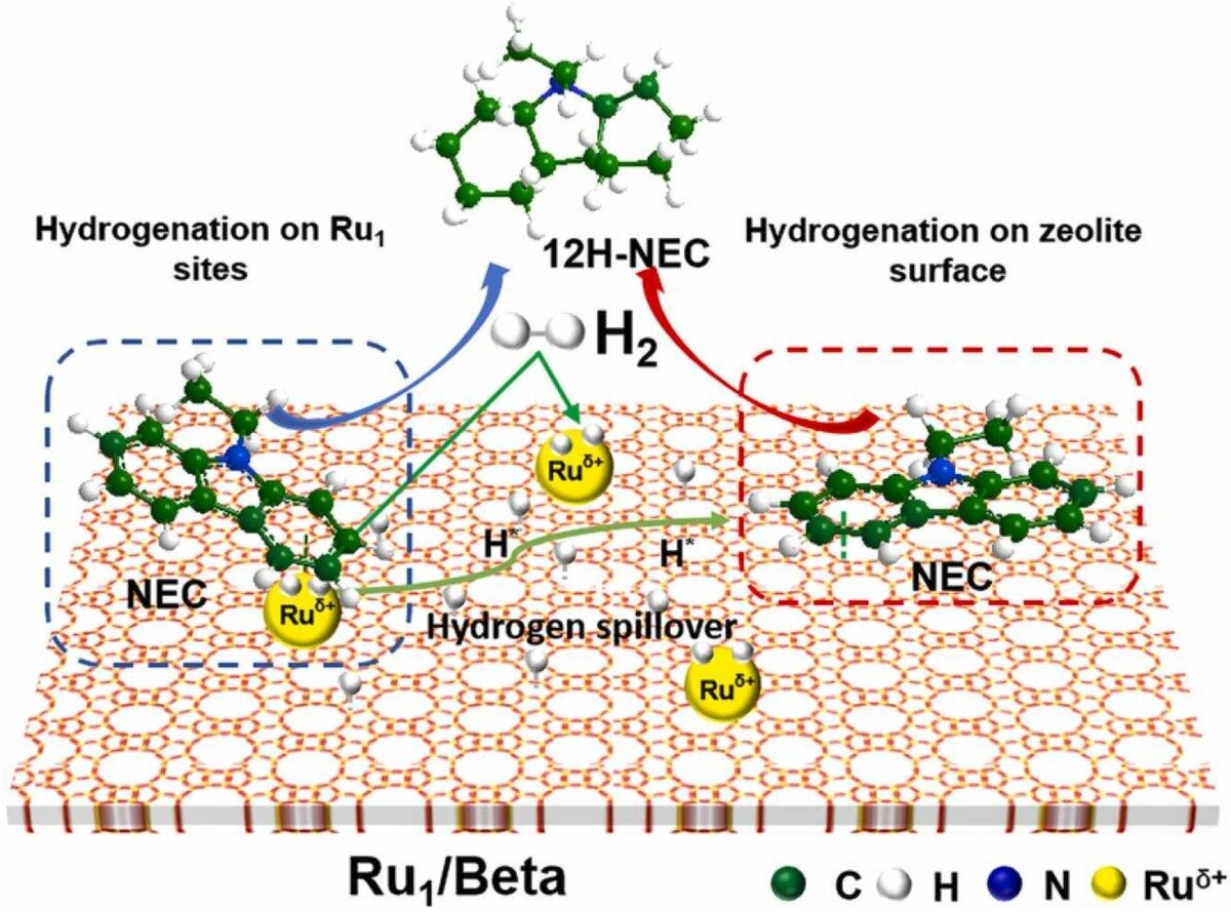

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Hydrogen energy is regarded as promising renewable energy. However,

the development of hydrogen energy is restricted by the safe and efficient storage and transportation of hydrogen. Therefore, it remains challenging to explore the feasibility of high-efficiency catalysts with low-cost in hydrogen storage under low temperature.

Now, a research team led by Prof. Chen Xinqing from the Shanghai Advanced Research Institute (SARI) of the Chinese Academy of Sciences developed synergistic catalysts of Ru single-atoms and *BEA zeolite for high-efficiency hydrogen storage of liquid organic hydrogen carriers (LOHCs).

The research results were published in *Applied Catalysis B: Environmental*.

Atomically dispersed Ru supported on *BEA zeolite was prepared by deposition precipitation for LOHCs. The researchers found that highly dispersed Ru single-atoms boosted hydrogen activation and the strong acid sites (Brønsted and Lewis) of zeolites promoted the hydrogen spillover on the hydrogenation with N-heterocycles.

Moreover, the synergistic effect of Ru single atoms and *BEA zeolite is crucial for accelerating the hydrogenation rate and lowering the activation energy compared with traditional Ru-based catalysts.

The synergistic catalysis of Ru single-atoms and zeolite with the assistance of hydrogen spillover exhibited excellent hydrogenation activity of N-ethylcarbazole (NEC), N-propylcarbazole (NPC), and 2-methylindole (2-MID) at lower temperatures with lower Ru content (0.5 wt%).

The synergistic catalyst of Ru single-atoms and zeolite provides a new strategy for the synergetic catalysis of zeolite-supported metal catalysts for fast hydrogen storage into aromatic LOHCs under mild conditions.

More information: Lixia Ge et al, Synergistic catalysis of Ru single-atoms and zeolite boosts high-efficiency hydrogen storage, *Applied Catalysis B: Environmental* (2022). DOI: 10.1016/j.apcatb.2022.121958

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