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Development of porous nickel catalysts by low-temperature Ni–Al chemical alloying and post selective Al leaching, and their application for ammonia decomposition

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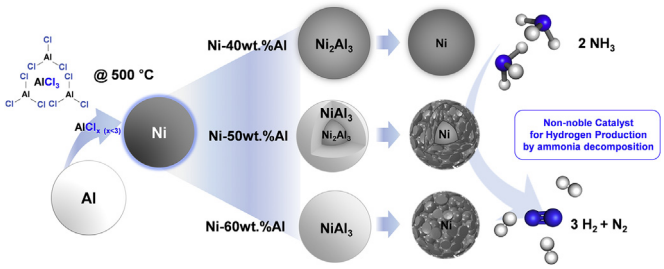
HIGHLIGHTS

- Ni–Al alloy powders were synthesized by a low-temperature chemical alloying method.
- Post aluminum leaching converts Ni–Al alloy precursors into porous nickel catalysts.
- Ammonia decomposition was successfully carried out using porous nickel catalysts.

GRAPHICAL ABSTRACT



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ABSTRACT

Micron-sized Ni–Al alloy powders (Ni–x wt.%Al, x = 40, 50, 60) were synthesized using the low-temperature chemical alloying (LTCA) at 500 °C. The three different as-prepared Ni–Al alloy powders were composed of Ni_2Al_3 and/or $NiAl_3$ phases while achieving thermodynamic equilibrium compositions (Ni–40 wt%Al, Ni_2Al_3; Ni–50 wt%Al, the coexistence of Ni_2Al_3 and $NiAl_3$; Ni–60 wt%Al, $NiAl_3$). The LTCA method demonstrates that it is capable of producing Al-rich Ni–Al alloy powders while maintaining a particle size similar to that of the starting Ni particles. The three Ni–Al alloy powders were used as precursor materials to

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