

Ammonia synthesis under mild condition

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With a high hydrogen content (17.6 wt.%), high energy density (4 kWh kg⁻¹), facile storage and transportation, NH₃ has been regarded as a potential energy carrier.¹ The key issue for NH₃ synthesis and decomposition is the development of non-noble metal based, highly active and stable catalysts that can be operated under mild condition. With the understanding of the interactions of hydrides/imides of alkali and alkaline earth metals (AM for short) with 3d metals and their nitrides, the catalyst systems, i. e., AMNH-3d transition metals for NH₃ decomposition and AMH-3d transition metals for NH₃ synthesis, have been developed. The unique chemistry among transition metals, alkali/alkaline earth metals, N and H creates an energy-favorable pathway allowing NH₃ synthesis/decomposition under mild conditions, i.e., NH₃ formation is detectable at 150 °C over the Mn-, Fe- and Co-LiH (or BaH₂) composite catalysts, respectively.^{2,3} The characterization of intermediate phases and surface clusters of catalysts provides interesting information that helps the elucidation of the step-wise reaction pathway.⁴

References

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