Multivariate Porphyrinic MOFs as Precursors of Nanoalloy Catalysts for Efficient Dehydrogenation of Hydrogen Molecular Carriers

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Rok wydania

2023

Czasopismo

ACS Applied Energy Materials

Numer woluminu

6

Strony

9136-9144

DOI

10.1021/acsaem.2c03625

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The realization of the Hydrogen Economy involves the development of efficient, safe, and lightweight H storage and delivery systems. Hydrogen molecular carriers (HMCs) have been proposed for this application, as they release and store H_2 after catalyzed hydrogenation/dehydrogenation cycles, but efficient catalysts are still needed. In this work, we present a methodology for the development of nanocatalysts, using porphyrinic multivariate metal–organic frameworks (MTV-MOFs) as a precursor of supported nanoalloys/nanocomposites (M/ZrO_2). MTV-MOFs with **PCN-222** structure, containing atomically distributed mixtures of Pd, Pt, and Ni, yield dispersed nanoalloys after calcination, with a high metal loading. Both support and catalytically active phases are produced simultaneously during thermal treatment. The obtained materials demonstrate synergistic effects in the catalytic dehydrogenation of hydrogen molecular carriers, namely, ammonia borane (AB), 2-methylpiperidine (2MP), and a liquid mixture of 2MP and DHC (dodecahydro-1*H*-carbazole).

Słowa kluczowe

metal−organic framework, MOF-derived, hydrogen storage, dehydrogenation, heterogeneous catalysis, ammonia borane, liquid organic, hydrogen carrier

Adres publiczny

http://dx.doi.org/10.1021/acsaem.2c03625

Strona internetowa wydawcy

https://www.acs.org/content/acs/en.html