Cobalt-based catalysts for hydrogen production by thermochemical valorization of glycerol: a review

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ABSTRACT

Rising energy needs and the exhaustion of fossil fuels are calling for renewable fuels such as dihydrogen (H_2), commonly named 'hydrogen.' Biomass treatment produces glycerol, which can be further used to generate dihydrogen or syngas. Here, actual challenges comprise the design of efficient and economically viable catalysts for attaining high hydrogen yield and minimizing coke deposition. Here, we review glycerol valorization routes for hydrogen or syngas generation, such as pyrolysis, steam reforming, aqueous phase, dry, supercritical water, partial oxidation, and autothermal reforming. We focus on cobalt-based catalysts due to their high availability, low cost, thermal stability, and coke resistance. The efficiency of cobalt-based catalysts can be improved by modifying textural properties, particle size and distribution, the strength of metal–support interaction, surface acidity and basicity, oxygen mobility, and reducibility. Such improvements have led to 100% glycerol conversion, 90% dihydrogen yield, and coke deposition of about 0.05%.

KEYWORDS

Cobalt catalyst; Deactivation; Glycerol; Hydrogen; Syngas; Valorization

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