عنوان مقاله:

A Phenomenological Survey on the Synergistic Role of Some of the Applicable Metals and the Support in the Steam Reforming of Logistic Fuels on Monometal Supported Catalysts

محل انتشار:

اولین همایش ملی انرژی های نو وپاک (سال: 1392)

تعداد صفحات اصل مقاله: 8

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خلاصه مقاله:

Our energy infrastructure dictates continued and increased use of fossil fuels for the next several years and maybe decades. The use of domestic resources, such as coal, is especially attractive. Clean power source utilizing vast reserves of other logistic fuels (such as kerosene and diesel) would be the main driver for high efficiency fuel cells. Hydrocarbon fuels such as diesel and jet fuel have logistics (well-established distribution network) and safety advantages for military applications compared to compressed hydrogen. Clean power source utilizing vast logistic fuel reserves (jet fuels, diesel, and coal) would be the main driver in the 21st century for high efficiency. Fuel processors are required to convert these fuels into hydrogen-rich reformate for extended periods in the presence of sulfur, and deliver hydrogen with little or no sulfur to the fuel cell stack. However, the jet and other logistic fuels are invariably sulfur-laden. Sulfur poisons and deactivates the reforming catalyst and therefore, to facilitate continuous uninterrupted operation of logistic fuel processors, robust sulfur-tolerant catalysts ought to be developed. New noble metal-supported ceria-based sulfur-tolerant nanocatalysts were developed and thoroughly characterized. In this paper, the performance of single metal-supported catalysts in the steam-reforming of kerosene, with 260 ppm sulfur is highlighted. It was found that ruthenium-based formulation provided an excellent balance between hydrogen production and stability towards sulfur, while palladium-based catalyst exhibited rapid and steady deactivation due to the highest propensity to sulfur poisoning. The rhodium supported system was found to be most attractive in terms of high hydrogen yield and long-term stability. A mechanistic correlation between the role of the nature of the precious metal and the support for generating clean desulfurized H2-rich reformate is discussed.

کلمات کلیدی:

energy, fossil fuel, catalyst, clean power source