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Catalytic steam reforming of liquefied oil for production of hydrogen: Effects of Ni based catalyst composition

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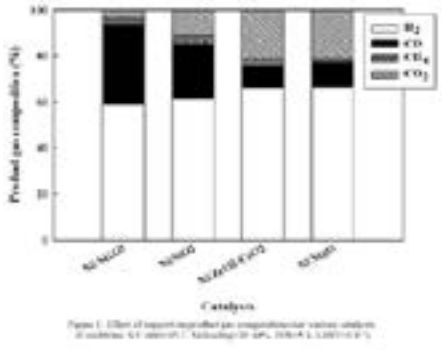
Hydrogen is an important raw material to replace fossil fuels in the future, or it may simply continue to be an important commodity widely used in industry. The conventional process of hydrogen production is the steam reforming of methane, light hydrocarbons, and naphtha. Biomass can be used an alternative feedstock for hydrogen production via two possible pathways, which are. Steam gasification and catalytic steam reforming of bio-oils converted from biomass by fast pyrolysis or hydrothermal liquefaction. Macro algae have been regarded as a sustainable biomass resource because of their high productivity and growth rates, no competition of land crops, and area availability. Therefore, the objective of this research is to study activities for catalytic steam reforming of macro algae derived oil over Ni/MTixOy based catalysts. Firstly, we studied effect of different supports such as Al_2O_3, SiO_2, ZrO_2-CeO_2 and MgO on the catalytic activities for hydrogen production. Secondly, we studied effect of metal on the MTixOy structures for hydrogen production. MTixOy composition by K, Ca, Sr and Ba which have different layered structure (K) and perovskite structure (Ca, Sr and Ba). Steam reforming reaction was carried out at 873-1173 K under atmospheric pressure in a fixed-bed reactor made of Inconel material. LHSV was change from 0.5 to 4 h-1 and product gases (H_2, CO, CH_4 and CO_2) were analyzed using GC-TCD. We have investigated MTixOy added Ni-based catalysts on the catalytic steam reforming of liquefied oil. It was found that a product composition was different depending on support materials. An acidic support (Al_2O_3) led to a higher selectivity for CO while a reducing support (ZrO_2-CeO_2) resulted in a higher CO_2 selectivity. It is believed that Zro_2- and CeO_2 was so-called oxy-transporters due to their oxygen conducting properties and can actively participate in the catalytic reaction by oxidizing or reducing reaction intermediates.



Biography

Hee Chul Woo is a professor in the department of chemical engineering at pukyong national university in korea, where he has taught since 1992. He received his B.S. degree (Inha University, Korea), M.S. degree (KAIST, Korea), and Ph.D. degree (POSTECH, Korea) all in chemical engineering and was a post-doctoral fellow at the university of california at Berkeley (1995-1996). In 2003 he has a visiting professor at the Virginia Tech. His research interests cover heterogeneous catalysis, adsorptive desulfurization from gases and liquid fuels, and bioenergy production and integrated utilization of marine biomass. Woo is general director of Aquatic Biomass Research Center and also a chairman of The Korean Society of Clean Technology.

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