SDEWES2016.0578 **Ammonia Production by HNO3 Generated from NOx**

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Abstract

The introduction of a hydrogen economy has been an available strategy to control criminate change when hydrogen is produced without CO_2 emission. However, use of hydrogen has a large energy loss for its transportation and physical storages. Ammonia is a hydrogen storage material that may solve several problems related to the hydrogen transportation and storage in a hydrogen economy. Therefore, an energy carrier and storage system using ammonia has been proposed. For example, a system consisting of the hydrogen production by electrolysis of water, ammonia synthesis from hydrogen, and the hydrogen generation from ammonia, is recognized as a hydrogen carrier and storage system without CO_2 emission. However, the efficiently ammonia synthesis is currently difficult, though some researches have been performed ammonia synthesis studies at a low temperature and pressure.

We have been developed an original deNO_x reactor using vacuum ultra violet (VUV) of 172 nm wavelength. Recently, we found that nitric acid (HNO_3) was easily produced from NO_x by photochemical oxidation. HNO_3 is an available material for NH_3 production, because NH_3 can generate from HNO_3 by reduction. For hydrogen production from NH_3, an original plasma membrane reactor also has been developed. These reactions have created a new hydrogen energy storage and carrier system consisting of the HNO_3 production reactor, the NH_3 production reactor, and the H_2 production reactor as shown in Figure 1.

In this paper, we focused on characteristics of the NH_3 production from HNO_3. The present study aimed to investigate fundamental characteristics of NH_3 production from HNO_3 using hydrogen. The effects of reaction time of H_2 was examined as shown Figure 2. Furthermore the effect of catalyst was investigated for an enhancement of NH_3 production.