Clean Energy Production with Municipal Sewage Sludge - Catalytic Reduction Technology of Fuel NOx from Syngas Bearing NH_3 -

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The stepwise catalytic burner described in this study aimed to minimize NO generated during NH_3 oxidation. The 1st catalyst utilized to achieve a high conversion of NH_3 to N_2 at low temperatures in short reaction time under fuel-rich condition. In the 2nd catalyst, NO generated in the 1st catalyst was reduced by the reductive gases possibly decomposed from methane in the 1st catalyst. At the same time, the remaining methane was completely oxidized in fuel-lean condition. Pd and Rh were supported La-doped Al_2O_3 washcoat. LNG was mixed with CO, H_2 and small amount of NH_3. Air was controlled to obtain fuel-rich and fuel-lean conditions at the 1st and 2nd catalyst beds, respectively. Under fuel-rich condition, the catalysts maintained high activities for hydrocarbons (HC) conversion and high selectivity of NH_3 conversion to N_2, which could be achieved to be higher than 95%, while keeping the formation of NO below 5% of the inlet NH_3. The unburned combustible gases from the 1st step were completely oxidized in the 2nd fuel-lean combustion step with reducing NO concentration. This work was financially supported by the ERC project of the KOSEF.