Tohoku Univ. Technology

Ammonia combustion device

Combustibility is promoted by deep ultraviolet irradiation!

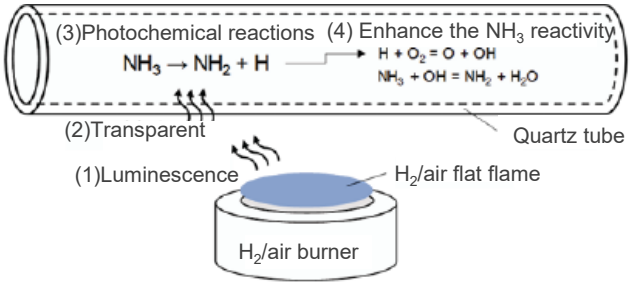

Figure 1: Schematic diagram of chemical and physical processes of NH_3 combustion (An Example of Promoting NH_3 Combustion in a Quartz Tube Using Chemiluminescence from a H_2 Flame as a Deep Ultraviolet Light Source)

Overview

Since ammonia does not emit carbon dioxide when burned, its use is expanding as an alternative fuel to fossil fuels. However, the combustibility of ammonia is inferior to that of fossil fuels, so some combustion support method to promote the oxidation reaction of ammonia is required for the development of combustors for ammonia.

As ammonia combustion support methods, intense preheating and the use of powerful igniters have been devised, but there are problems such as the need for high thermal energy, the increase in material cost for high thermal load, and the decrease in durability. Therefore, a low-cost and simple method has been required.

The present invention has found that the combustibility of ammonia can be easily promoted only by irradiating deep ultraviolet light. As shown in FIG. 1, ammonia is excited by deep ultraviolet light, and the excited ammonia is decomposed into active radicals (NH_2 and H) to promote combustion reaction. Since deep ultraviolet light emission from a hydrogen flame is very weak, the energy required for deep ultraviolet light irradiation by an electric device is low, and the present invention is a simple and low-cost ammonia combustion supporting method.

Effect

Deep UV light from H_2 flame enhance the NH_3 reactivity.

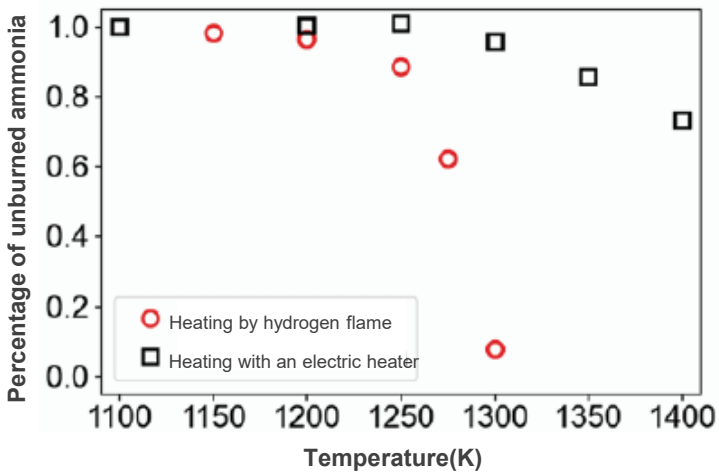

Figure 2: Differences in ammonia consumption with and without deep ultraviolet light at the same temperature conditions

Product Application

- Combustor for thermal power generation
- Automobile, ship and aircraft engines
- Heating furnaces, burners, etc.

Related Works

[1] Fuel Communications, Vol.21 (2024), 100130

IP Data

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