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# 大気圧マイクロ波プラズマによる水素燃焼時のガス温度特性

# Gas Temperature property during hydrogen combustion in atmospheric pressure microwave plasma

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Recovery of tritium in a nuclear fusion reactor building is an important concern. Current tritium removal systems remove tritium from a gas by cracking the tritium-containing components on a heated precious metal catalyst. The tritium combines with oxygen in the air stream to form tritiated water. Then, the tritiated water contained in the air stream is removed by a molecular sieve bed. Although this system offers adequate efficiency, problems such as a high pressure drop, the use of a large amount of precious metals, and inefficient heating occur when the processing throughput is quite large.

To resolve these problems, we experimentally investigated hydrogen combustion by atmospheric pressure plasma generated by a 2.45 GHz microwave discharge (Fig.1). Small amounts of hydrogen and oxygen were mixed in the operational argon gas during discharge. To clarify the details of combustion, optical emission was measured. The constituents of combustion-processed gases were observed by a quadruple mass spectrometer. So far, we observed the degree of hydrogen oxidation, the so-called conversion rate, increased with input microwave power. The maximum hydrogen conversion rate was greater than 80%. During discharge, an optical emission peak due to OH radicals was also observed[1,2].

In this paper, as additional experimental results, gas temperature measurement (Fig.2) and the power balance during hydrogen combustion in an atmospheric plasma discharge are discussed.

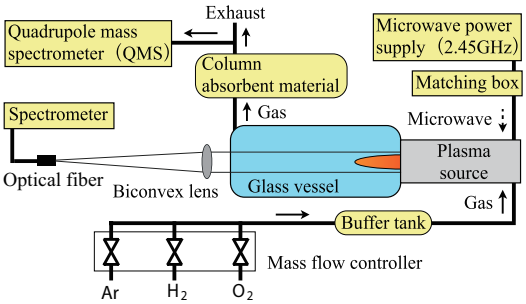


Fig.1: Experimental setup for hydrogen oxidation using an atmospheric pressure microwave plasma torch.

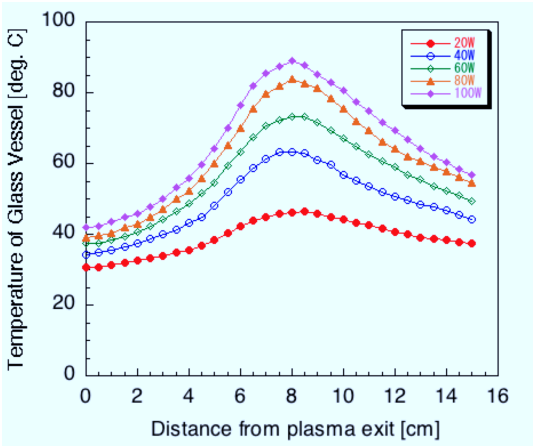


Fig.2: Temperature profile observed on the top of the Glass vessel during hydrogen combustion ($H_2$=0.04, $O_2$=0.4, Ar=2.26 L/min).

[1] K. Akahane, N. Ezumi, Y. Uesugi *et al.*, Fusion Sci. Tech., **60**, 1343 (2011).
[2] N. Ezumi, K. Akahane, K. Sawada *et al.*, Plasma Fus. Res. **7**, 2401075 (2012).