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Effect of oxygen atoms dissociated by non-equilibrium plasma on flame of methane oxygen and argon pre-mixture gas[1] HARUAKI AKASHI, TOMOKAZU YOSHINAGA, National Defense Academy, KOICHI SASAKI, Hokkaido Univ. — For more efficient way of combustion, plasma-assisted combustion has been investigated by many researchers. But it is very difficult to clarify the effect of plasma even on the flame of methane. Because there are many complex chemical reactions in combustion system. Sasaki et al [1] has reported that the flame length of methane and air premixed burner shortened by irradiating microwave power. They also measured emission from Second Positive Band System of nitrogen during the irradiation. The emission indicates existence of high energy electrons which are accelerated by the microwave. The high energy electrons also dissociate oxygen molecules easily and oxygen atom would have some effects on the flame. But the dissociation ratio of oxygen molecules by the non-equilibrium plasma is significantly low, compared to that in the combustion reaction. To clarify the effect of dissociated oxygen atoms on the flame, dependence of dissociation ratio of oxygen on the flame has been examined using CHEMKIN. It is found that in the case of low dissociation ratio of 10^{-6}, the ignition of the flame becomes slightly earlier. It is also found that in the case of high dissociation ratio of 10^{-3}, the ignition time becomes significantly earlier by almost half.

[1] K. Sasaki et al, J. Phys. D:Appl. Phys., 45, 455202 (2012).

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