# Measurement of activation energy of combustion of methane-air mixture using the thin-fiber pyrometry method

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This paper presents the latest results of the experimental measurement of activation energy of methane-air mixture. The thin-fiber pyrometry method is used. The experimental plant includes the flat porous burner which position can be regulated vertically, the gas mixture leaking from the burner, thin filament made of silicon carbide (SiC) to measure the gas temperature, and the thermal imager OPTRIS PI. The flow rate of the gas can be adjusted by Bronkhost Elflow controllers.

By measuring the gas temperature dependence on the height above the burner, it is possible to determine the maximum flame temperature, which is close to the temperature of adiabatic combustion (Fig.1). According to the formula [1]

$$M = A \exp\left(-\frac{E_a}{2RT}\right), \quad (1)$$

changing the mass flow of the gas $M$ and measuring the maximum temperature $T$ it is possible to find the activation energy $E_a$ for certain methane concentration in the mixture as a slope of the line (Fig.2). This experiment was carried out for various methane-air mixtures with different φ – ratio of methane to air. The results are compared with the numerical calculation which uses the GRI 3.0 method [2] (Fig.3).

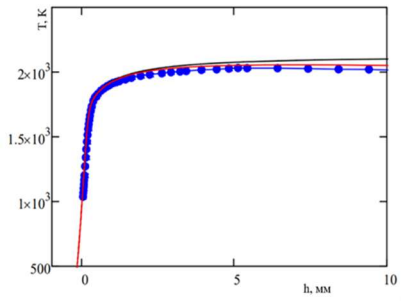


Fig.1. Temperature dependence on the height. Blue dots - experiment, red line - numerical calculation, black line - adiabatic combustion.

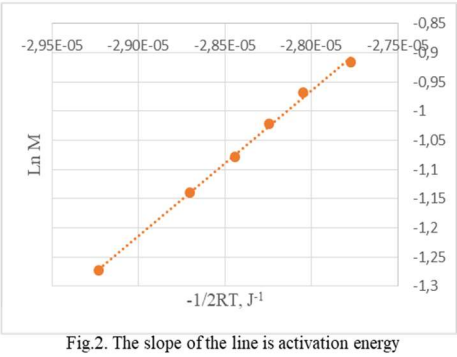


Fig.2. The slope of the line is activation energy

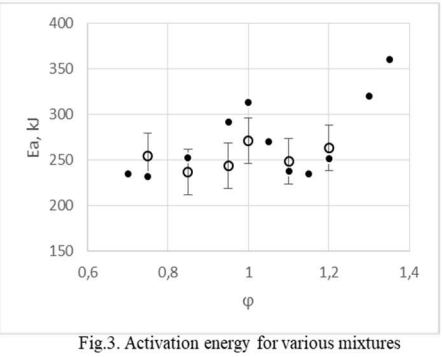


Fig.3. Activation energy for various mixtures

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## References

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