# Ignition dynamics of $H_2$/CO/air mixture after photodissociation of $O_2$ molecules by a UV laser pulse

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Ignition process and early stage of combustion of the $H_2$/air and the syngas ($H_2$/CO – 1:1)/air mixtures after the photodissociation of oxygen molecules were investigated using the approach described in [1]. The analysis of the consecutive series of OH* radical chemiluminescence images registered from the focusing area of ArF excimer laser radiation employed for the photodissociation was performed to obtain ignition delay times and combustion front propagation speeds for the considered mixtures.

The laser radiation at 193 nm wavelength (110 mJ per 10 ns pulse) was focused to the center of a pulsed burner to generate oxygen atoms which caused the ignition of the mixtures at fuel-air equivalence ratios 0.8–1.6, pressure of 1 atm and temperature of 578 K. Images of the 80 $mm^2$ ignition region were registered at short exposure times in the spectral range 260-390 nm using a CCD-camera. The time delay between the photodissociating laser pulse and the camera shutter was being varied from 10 to 400 µs. Ignition delay times for $H_2$/air and syngas/air mixtures under the experimental conditions equal 46 and 78 µs, respectively, were determined. Combustion front of the $H_2$/air mixture showed twice-higher propagation speed with respect to that of the syngas/air mixture.

A numerical simulation of the ignition process was performed based on a two-dimensional approach employing the detailed kinetic mechanism and the results of laser radiation absorption modeling. Results of the calculation showed a good agreement with the experimental data.

The realized approach proved to be a productive way to investigate the ignition process of gaseous mixtures under controlled nonequilibrium conditions created by laser radiation.

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## References

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