

CONDITIONS OF SPIN FLAME FRONT FORMATION PROPAGATING IN A NARROW SLOT

M.M. Alexeev, I.V. Smirnova

Surgut State University
628412, Surgut, Russia

The purpose of this work is to study the regularities of formation and propagation of the spin flame front in propane-air mixture in the narrow slot. The open slot is formed by two flat circular glass plates. The gap between the plates was varied from $2 \cdot 10^{-3}$ m to $15 \cdot 10^{-3}$ m. The space between the plates was filled with propane-air mixture through the hole in the center of one of the plates. Ignition of propane-air mixture was produced from the center of the plates with a high-voltage spark discharge between the electrodes. The process of flame front propagation was filmed with high-speed digital video camera.

Of the many experiments follows that disturbances occur on a cylindrical flame front of which under certain conditions two nuclei of spin are formed - strongly curved parts of the flame front with a distinct leading points which move along a spiral trajectory.

The formation of spin nuclei as follows from experiments is possible only when burning mixture with the lack of air. Lewis and Peclet numbers determine the range of the sustainable expansion of a cylindrical gas flame and the spontaneous formation of a spin front in the infinite slot. Of the many experiments follows that there is the range of the Lewis and Peclet numbers of the flame front instability to small-scale perturbations, the region where the formation of two symmetric nuclei spin and the region which corresponds to the formation of arc-shaped "tails" from the spin nuclei.

The combustion chamber shape of a narrow slot provides the evolution of spin nuclei along the surfaces bounding the gas flow. The use of complex wall surfaces of the combustion chambers (non-parallel surfaces, the surfaces of coaxial cylindrical tubes, etc.) clearly allows a variety of forms of the spin flame front.

Keywords: spin flame front; flame propagation; combustion chamber; flame instability.