This paper reviews the works of the 3rd International Workshop and Exhibition on Plasma Assisted Combustion, which dealt with the last achievements in the following scientific fields: fuel conversion and activation, plasma ignition of fuels and flame control, plasma generation and modelling, waste treatment and utilization, and promising industrial technologies.

The 3rd International Workshop and Exhibition on Plasma Assisted Combustion (IWEPAC-3) [1] is traditionally held in Fall Church, the satellite town of Washington. In 2007 it was held on September 18–21. The organizers of this Workshop were Plasma Applied Technologies and Los Alamos National Laboratory (США). At the known international workshops and symposia on physics of plasma and plasma chemistry [2–4], application of solid fuels and fuel systems [5–8] and combustion [9, 10] the calculation-theoretical, experimental and applied research on plasma interaction with fuel were presented in separate sections: “Plasma assisted combustion” and “Promising technologies of solid fuel application”. Most of these works are attributed to the fundamental research. In contrast to the above scientific conferences, this workshop assembles the specialists working in a relatively narrow field of generation, investigation, and application of low-temperature plasma for ignition, activation, and conversion of gaseous, liquid and, solid fuels, and municipal wastes, as well as the potential consumers of plasma technologies (heat power plants, boiler stations, mobile power installation, etc.), representatives of industrial enterprises and investors. In this connection, IWEPAC-3 represents mainly the developments of practical intention and high potential of commercialization.

More than 50 specialists from USA, Canada, Brasilia, Great Britain, Ukraine, Russia, and Kazakhstan participated in this Workshop. The Workshop was organized as five breakup groups with daily subject round work tables. The round work tables discussed possibilities for application of plasma technologies and overcoming methods for difficulties arising at their adoption. Thirty five reports of half-an-hour duration were heard. The exhibition organized at the experimental basis of organizing company Plasma Applied Technologies (McLean, USA) attracted a great interest. Together with exposed advertising stands, the operating plasma devices for fuel ignition, gasification, and conversion were demonstrated.

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The Workshop operated in five following areas: “Fuel conversion and activation”, “Plasma ignition and flame control”, “Plasma generation and modelling”, “Waste treatment and utilization”, and “Promising industrial technologies”. The breakup group “Fuel conversion and activation” paid special attention to environmentally friendly technologies of plasma gasification of coals, syngas, and hydrogen production from liquid and solid fuels [11–14]. Since one of the main criteria of plasma technology competitiveness is specific power inputs for the process, it is reasonable to combine plasma technology with conventional methods of heat and mass transfer intensification. Thus, the technology of plasma-vortex gasification of liquid and solid fuels and gas conversion is suggested in [11, 12]. The flow plasma-vortex reactor with four plasmatorches in the bottom part was developed (Fig. 1). Fuel is fed to the arc zone of plasmatorches, treated thermochemically there and gasified in the quartz reactor. To compensate the endothermic effect of gasification reactions, the source of high-frequency plasma at the beginning of reaction zone is used. As a result of combined action of low-temperature plasma and vortex flows, the gasification degree of coal from Powder River deposit (USA) with combustion value of 13 000 kJ/kg and average size of particles of 60 µm reaches 95%. A high-quality syngas consisting of 70% of hydrogen and carbon monoxide is produced. At coal consumption of 7.7 kg/h and spent electric power of 15 kW, the heat power of produced gas reaches 55 kW. The efficiency of hybrid plasma-vortex system of coal gasification reaches 70%. Paper [13] deals with investigation of ethanol conversion in a DC electric-arc discharge. To make an electric discharge in liquid fuel, the plasma reactor shown in Fig. 2 is used. At plasma gasification of initial reaction mixture consisting of ethanol, water, and air, hydrogen-enriched syngas of the following composition was obtained (vol.%): H₂ — 40.4, CO — 14.5, CH₄ — 5.7, C₂H₅ — 2.6, C₃H₄ — 2.3, C₂H₆ — 0.7, C₂H₅OH — 0.3, CO₂ — 1.0, H₂O — 2.1, O₂ — 12.5, N₂ — 18.0. A new application method for syngas produced by

**Fig. 1.** Plasma-vortex gasifier.

**Fig. 2.** The scheme of plasma reactor.

1 — gas output, 2 — air, 3 — metal lid, 4 — glass tube, 5 — fuel, 6 — gas channel, 7 — cooling water, 8 — quartz tube, 9 — plasma, 10 — electrodes, 11 — bubbles.