STUDY OF MICROWAVE DISCHARGE IN LIQUID *N*-HEPTANE BY METHODS OF EMISSION SPECTROSCOPY AND CHROMATOGRAPHY

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This paper continues the cycle of studies of microwave discharges in liquid hydrocarbons. Previously, solid products formed in the discharge were studied [1–3], changes in a liquid hydrocarbon after ignition of a microwave discharge in it were studied [4], two-dimensional modeling of the discharge in liquid n-heptane was carried out in [5], the developed kinetic model of processes in discharge in view of the formation of a solid phase is given in [6]. This paper presents the results of the study of the emission spectra of the discharge and gas-phase discharge products.

A discharge in the volume of liquid n-heptane was initiated at the end of the central conductor of the coaxial line (diameter 1.5 mm). The pressure above the surface of the liquid was equal to the atmospheric pressure. In a series of experiments, argon was fed through a channel in the central conductor of the coaxial line (flow rate 6–40 l/h). The products of the gas phase were analyzed by gas chromatography. The emission spectra of the discharge were analyzed using an AvaSpec 2048 spectrograph and the gas and vibrational temperatures were determined from the radiation of the Swan-bands.

It was shown that the emission spectra of microwave plasma in liquid *n*-heptane with and without bubble flow of argon at atmospheric pressure above the surface of a liquid are studied. Without the addition of argon and with its small expenditure in the emission spectra there is no emission of atomic lines. An analysis of the emission of Swan bands showed that the addition of argon at a flow rate of 6–40 l/h does not change the rotational temperature of the state , which is ~2000 K. At atmospheric pressure this temperature can be identified with the gas temperature. When the flow of argon is high, the plasma emission spectrum becomes more complicated, and the emission of the Нα line appears in it, and with an increase in the addition of argon, as well as lines Нβ and lines of argon radiation. The range of the microwave field strength in the plasma (2000–4000 V/cm) is determined from the ratio of the emission intensities of the *Нα* and *Нβ* lines.

It was shown that the main gaseous products of the discharge are hydrogen, methane, ethylene, and acetylene. Hydrogen have highest volume concentration and methane have the minimal concentration. Ethylene and acetylene have close concentration with predominance of acetylene. Addition of argon does not change the distribution of main products.

References

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