Stimulated emission of adsorbed gas and substance ions from the surface

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It is known that soft X-ray radiation of laser plasma is adsorbed in near-surface layer with the depth of 1 to 2 micrometer. As a result of secondary electron ionization, some of the released electrons, which have a certain energy spectrum, ionize molecules on the surface of the sample, breaking chemical bonds. To register the formed ions, a positive buoyancy voltage was applied directly to the sample, and the ionized fragments of the sample under study were recorded on a time-of-flight mass analyzer.

During the experiment, the sample was irradiated by focused intense soft X-ray radiation from a laser plasma. The focusing of soft X-ray radiation into a spot with a diameter of about 2 mm and the protection of the sample from other plasma products was carried out by using an X-ray concentrator [1]. The pulse duration is ~ 20 ns with an energy in a soft X-ray radiation pulse of about 1 mJ with a soft X-ray radiation spectrum from 60 to 1000 eV and a power of $5*10^4$ W [2].

In a vacuum chamber, the sample was placed on a copper conducting plate, to which a positive voltage was applied, with subsequent fixation by means of glue or clamps. In the course of the work, results were obtained for several substances such as glycine, caffeine and PTFE.

The analysis of the obtained mass spectra indicates a significant contribution to the results obtained from ions of residual gases. But, despite this, we managed to identify characteristic areas in the mass spectra that correspond to those expected for the analyzed substances.

References

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