The role multi-photon processes at the breakdown of sodium chloride by femtosecond laser pulses

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In conducting works the action of laser pulses with a duration 80 fs at a wavelength of 1240 nm and a duration 40 fs at a wavelength of 800 nm on crystals of sodium chloride was studied [1, 2].

One of the main reasons for laser destruction of transparent ionic dielectrics is the effect on the volume of an electron avalanche [3]. In the case of a high-intensity field, the source of the avalanche is the charges arising due to the multiphoton photoeffect [3, 4]. It was found that the higher the field strength, the higher the multiphoton process can be [4].

The band gap of NaCl, according to [5], is 9.5 eV. Then, in order to overcome this zone, an electron needs to absorb 6-7 quanta, at a wavelength of 800 nm, or 10 quanta, at a wavelength of 1240 nm.

According to [4, 6], the 6-photon photoelectric effect should be realized at a lower field strength than the 10-photon photoelectric effect. In the experiment, the critical field strength of the (100) NaCl face at a wavelength of 800 nm turned out to be 1.2 times higher than at a wavelength of 1240 nm [1, 2].

Thus, multiphoton processes play an important but not decisive role in the radiation destruction of sodium chloride by femtosecond laser pulses.

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