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Research on trigger mechanism of Laser Triggered Vacuum Switch

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According to the preliminary study, the Laser Triggered Vacuum Switch (LTVS) might be an advanced high-voltage, high-intensity pulse switch. It will have the advantages of short trigger delay time and good isolation from the main circuit. The study of the trigger mechanism of LTVS is conducive to both the optimization and the miniaturization of it, and beneficial to promote its practical process. In this paper, the LTVS which has a composite target electrode made of potassium chloride and titanium is studied. The energy loss of the target before and after the trigger is compared by X-ray spectroscopy. And based on the result, the composition of the plasma mass generated by LTVS is analyzed. The trigger mechanism of LTVS is proposed for laser ablation according to the trigger physical phenomenon and the analysis above. Meanwhile, the interaction between laser and the target is divided into three stages: the heat transfer stage, target reaction stage and plasma formation stage. In the experiment, both the electron microscope images of target ablation and the switch delay at different wavelengths and different trigger energy are studied. The results show that the hypothesis about trigger mechanism is in good agreement with the experimental data. The research about the trigger mechanism of the LTVS is of great guiding significance for its optimization and application.

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