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## Experimental study of graphite electrode erosion under premixed atmosphere in spark gap switch

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The spark gap switch with graphite electrodes is widely used in the high-power laser system. Affected by the heat flux of the high-current arc, the graphite will sublimate in a short time. The sublimation characteristic determines the lifetime of the graphite electrode. To study the effects of gas composition on the erosion rate, three kinds of mixture gas are chosen to work as the discharge atmosphere. All of them contain 20% oxygen, and other parts are nitrogen, helium, and argon respectively. In theory, the sublimation of the electrode is transferred into the gas state of carbon oxide and the solid state of simple substance carbon, but the too much solid state will damage the insulating property. The paper aims to research the effect of the atmospheres on the evolution of graphite. The current integral method is adopted to calculate the transfer charge of the pulsed arc, which is a basis for the measurement of arc power. Meanwhile, the concentration of gas products in the switch chamber is measured by a flue gas analyzer. It is found that, compared with the usual nitrogen-oxygen atmosphere, the discharge with inert gas can significantly reduce the ablation of the electrode. Especially in the case of the mixture of argon and oxygen, the sublimation of graphite electrode decreases significantly. The higher oxidation efficiency can directly reduce the mass of solid residue. In the inert gas atmosphere, the oxide proportion is higher, and more sublimation carbon translates into gaseous. The premixed gas with argon and oxygen is better than traditional gas in the switch chamber. In the method of optimizing premix gas, the electrode erosion rate can be reduced, which is beneficial to the lifetime of the electrode.

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