ON THE MECHANISM OF OPERATION OF A CATHODE SPOT CELL IN A VACUUM ARC

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The erosive structures formed on a tungsten cathode as a result of the motion of the cathode spot of a vacuum arc over the cathode surface have been examined. It has been found that the mean mass of a cathode microirregularity having the shape of a solidified jet is approximately equal to the mass of ions removed from the cathode within the lifetime of a cathode spot cell carrying a current of several amperes. The time of formation of a new liquid-metal jet under the action of the reactive force of the plasma ejected by the cathode spot is about 10 ns, which is comparable to the lifetime of a cell. The growth rate of a liquid-metal jet is ~10^4 cm/s. The geometrical shape and size of a solidified jet are such that a new explosive emission center (cathode spot cell) can be initiated within several nanoseconds during the interaction of the jet with the dense cathode plasma. This is the underlying mechanism of the self-sustained operation of a vacuum arc.

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