DESTRUCTION OF THE INSULATOR OF THE HIGH VOLTAGE ELECTRODE OF THE ELECTRIC DISCHARGE REACTOR

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An integral part of the electric discharge reactor is a high-voltage electrode, which in the simplest version is a current conductor enclosed in an insulating sheath. The electrode experiences significant loads of various kinds - thermal, mechanical and electrical, often acting simultaneously. The intensity of the impact on the electrode depends on many factors: the energy of single pulses; the environment in which the electrode operates; reactor material; reactor volume, etc.

The most important case. from the point of view of the resistance of the electrode insulator, is the operation of the electrode in a limited space, calculated in units of cubic decimeters. Under such conditions, significant pressures arise (if the working medium is represented by a liquid), reaching hundreds of MPa [1]. Such pressures arise, among other things, as a result of wave processes accompanied by reflections from the walls of the reactor and other elements located in the zone of action of the electric discharge. In addition, the flowing pulsed currents can reach tens of kA, causing heating of the insulator until it melts. As a result, it is required to protect the electrode insulator from damaging effects.

The paper considers the destruction of the electrode insulator by the type of melting, mechanical crack and electrical erosion. In contrast to the destruction of the current lead, the destruction of the insulator is catastrophic (instantaneous) in nature, when these destructions lead to a rapid loss of electrode performance. Known solutions [2,3,4] to protect the electrode insulator from destruction are not universal for all conditions of its operation.

Figure 1 shows three main cases of destruction of the electrode insulator. Destruction of the insulator by individual types may occur, and sometimes with their simultaneous development.

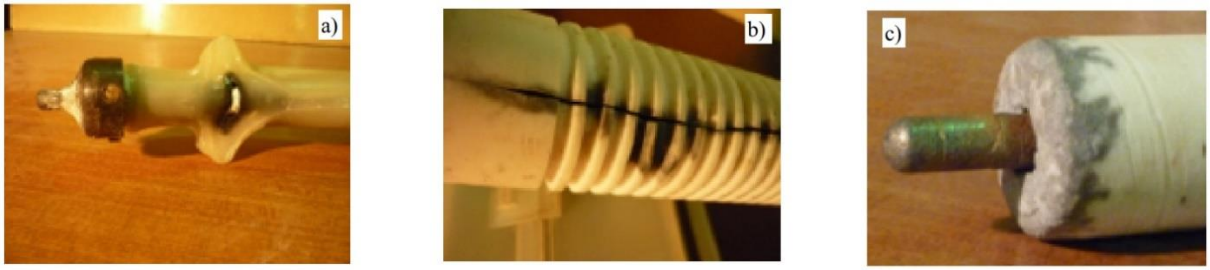

Fig 1. Types of destruction of the high-voltage electrode insulator
a) melting of the insulator, b) mechanical destruction of the insulator, c) electrical erosion of the insulator

Most often, materials such as polyethylene, caprolon, fluoroplast, fiberglass, which have a high resistance to deformation, are used to insulate the current conductor of the electrode. They, in addition to good insulating properties, must have significant mechanical characteristics. This requirement is due to the need to use insulators, including as a structural material. When choosing an insulator material, one must be guided by the specific conditions under which the high-voltage electrode will operate. For example, if the insulator operates under thermal stress, it is recommended to use a PTFE insulator. If significant mechanical loads will act, then the use of fiberglass is recommended. It should be noted that fiberglass and fluoroplast have little resistance to electrical erosion. Sometimes an effective method of dealing with mechanical loads is the constructive solution of the insulator in the zone of high mechanical loads, when the insulator is made in a streamlined shape.

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