

Response of solid dielectrics to combined electrical and mechanical pulse critical action

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A criterion based on the Landau potential is proposed to describe the experimental data on the fracture of materials under pulse impact. The introduction of a parameter characterizing the time interval necessary for the beginning of the destruction process, i.e., the time of energy accumulation at constant entropy, showed the generality of the destruction process. In a wide range of exposure durations (rise time from ps to microsec), a dependence describing the increase in mechanical strength with decreasing exposure time was obtained, with the energy accumulation time being a material characteristic. A similar dependence was obtained for the electrical pulse strength of some dielectrics. It is revealed that the relative power required for fracture or breakdown depends only on the ratio of the duration of exposure to the time of accumulation of the corresponding energy. The possibility of using the proposed criterion to determine the threshold pulse loading in conditions of combined pulse mechanical and electrical effects is shown.