北京建筑大学
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ENGINEERING AND ARCHITECTURE

Review

of the member of the dissertation council for the dissertation of G.A.Volkov on the topic: «Incubation Characterisitics of Critical State of Condensed Matters», submitted for the degree of Doctor of Physico-Mathematical Sciences in scientific speciality 1.1.8. Solid Mechanics.

The mechanical properties of different solid and liquid materials under dynamic loading are different from that under static loading. The deformation and fracture of materials under intensive dynamic loading remains one of the most important problems of modern scientific and engineering practice. Therefore, the dissertation titled «Incubation Characterisitics of Critical State of Condensed Matters» has essential scientific and technical significance.

In this dissertation, the structural-temporal approach based on incubation time was used to qualitatively and quantitatively study the deformation and fracture of condensed matters. The advantage of this approach is that the incubation time of fracture of materials under dynamic loading is a material property that does not depend on the loading history and the sample geometry. This endowes this approach an universal feature. The main scientific novelties are as follows:

1.Developed methods for processing dynamic test data, allowing to estimate the values of the incubation time parameter, which determines the time sensitivity of a continuous medium to the loading rate, and the critical stress that determines the stability of the medium directly to the stress level of the loading.

2.Revealed the influence of equilibrium parameters of a continuous medium, namely temperature and external hydrostatic pressure, on the values of model strength characteristics. .

3.Found optimal modes of impact destructive action on a continuous medium during contact interaction, with the aim of substantiating the practical significance of the developed methods based on the concept of incubation time.

4.Established a relationship with the parameters of other phenomenological approaches that predict critical conditions for the fracture of continuous media under high-speed impacts, identifying a new mechanical interpretation of the basic parameters of the incubation time criterion.

Considering the above, I believe that Volkov`s dissertation on the topic: «Incubation Characterisitics of Critical State of Condensed Matters» meets the requirements of speciality 1.1.8. Solid Mechanics.

No violations of paragraphs 9 and 11 of the Order No.11181/1 as of November 19, 2021 "On the Procedure for Awarding Academic Degrees at St. Petersburg State University" have been detected.

The dissertation meets the criteria of dissertations for the academic degree of doctor of Physico-Mathematical Sciences, established by the specified Order. The dissertation is recommended for the defense at St. Petersburg State University.

Some additional suggestions for improving the dissertation are as follows:

1.For solid materials the incubation time can be understood to some extent from the viewpoint of internal structure of solid and crack dynamics, but for liquid cavitation the physcial meanining of incubation time is not clear.

2.In the supersonic and subsonic contact interaction of the impactor with an elastic medium, their destruction is evident, which should be considered in the future work.

3.The analytical method for determining incubation time is preferable.

4.What factors determkine the confidence interval for the incubation time?

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