MATHEMATICAL MODEL FOR LINING THE SURFACE OF THE MECHANOREACTOR DURING GRINDING*

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Grinding is an important stage not only for mechanochemical synthesis, but also for many manufacturing processes with the use of powder materials [1, 2]. At the same time, despite the relevance of research aimed at reducing energy consumption and optimizing grinding, the problem is far from being solved. The existing concepts revealing the physical features of the process do not allow reliable mathematical models to be constructed to describe the mechanical processing of solids. The equations derived by various researchers to determine the kinetics of grinding are essentially phenomenological, based on experimental data. Such equations contain empirical constants.

One of the problems of efficient using high-energy grinding equipment is associated with the adhesion of the ground material on the internal surface of the mill drum and grinding bodies [3, 4]. This process can lead to the fact that a significant amount of the ground material will be in the layers formed on the working surfaces. This type of self-lining reduces the performance of grinding equipment, creates additional manufacturing difficulties for the extraction of substances and cleaning of working surfaces.

It is necessary to mention the works on the modeling of mechanochemical reactions [5, 6], when the process starts after the complete lining of the working surfaces of the mechanoreactor by the substance.

In this work, a macroscopic mathematical model was constructed for the lining process when a multicomponent mixture was subjected to mechanical processing in the high-energy mill. It was shown that varying the values of the parameters of the mill and mechanical processing time can have a significant effect on the dynamics of lining the internal surface of the mechanoreactor by a ground mixture.

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