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Research on the impact of mass fractions of multi-element granular structure on the mixing process

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J. Królczyk, M. Tukiendorf

Department of Agricultural and Forest Technology, Opole University of Technology,
Mikołajczyka 5, 45-271 Opole, Poland

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abstract Knowledge concerning mechanisms that govern the mixing process of multi-element heterogeneous granular structures is still not sufficient. The description of a mixing process where one of the factors is the randomness of particle motion causes additional difficulties. In the article, the authors make an attempt to describe the mixing process of a nine-element system which is a collection of grains of different characterization, among others, the size of grains, densities, or the shape of the mixed elements. In order to describe the process, the cluster analysis is used and thanks to this, homogeneous subpopulations are distinguished out of items originating in heterogeneous population. In the described case, the heterogeneous population is the output data matrix in which to each element of the mixture there is assigned the percentage portion of the elements after 30 min of mixing obtained during the research. The research was carried out in industrial conditions in a vertical mixer with worm agitator. The total mass of the mixed material was 2000 kg. The dendrogram analysis illustrating taxonomic distance between the elements of the mixture allowed to describe which of the elements had the greatest impact on the course of the process in the researched device.

keywords granular material, heterogeneous granular structure, multi-element granular structure, cluster analysis