

Controlling method of rubber architecture containing powdered vulcanizate

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Abstract

The technological features of rubbers architecture control containing powdered vulcanizate (PV) are considered. Technological aspects of producing of mixtures containing modified PV are investigated. The efficiency of using the methods of control and regulation of the process is presented. The possibility of calculation of variances of vulcanizate usage as a component of composite and norms of its distribution in matrix.

Key words: POWDERED VULCANIZATE, COMPOSITE, PERCOLATION FILTRATION, CLUSTER, LATTICE POINTS, THROUGHPUT RATE

The modern tendency of development of polymer materials science consists in researching rational ways of using known materials in response to modification of properties. Solving of ecological problems is a priority area in the development of modern economic paradigm. Assessment of capability for repeated

application, both waste of Rubber Technical Products, and shockproof rubbers is one of them [1]. Therefore, the problem of regulation both sorptive and chemical activity of PV by means of its modification is essential for supporting of high level of structural behavior of rubber containing powdered vulcanizate.

It is known, [2], that active centres forming vulcanization network are developed during manufacturing process of compounded rubber.

It is necessary to show reasonably a real process of interacting of separate components in united thermodynamic system for creation of process mathematical model, in order to specify more completely the manufacturing method in compliance of set accuracy and maximum automation of control process. It is better to use general physics methods for solving of target goal. The building-up process of aimed technology environment is directly connected with complex of control technique. Principally, control devices, are based on conversion of energy of different physical factors and phenomena into definite informative signal, which requires additional automatic processing for control regulating action on the controlled process with defined technique in case of kipping of desired accuracy. Practically, for analyses of multicomponent system, physical and thermodynamic methods of analysis with further control are used. But such methods have overall character and require certain practical analysis for each case. The usage of suggested method, is based on the lowest regulating actions and makes it possible to provide a staff with data reasonably.

In physics and chemistry, the percolation filtration is the effect of streaming or non-streaming of liquids through the porous materials. The theory of percolation filtration is used for description of different systems and phenomena [3]. Solving the set task with the help of percolation theory, first of all, there considered the phenomenon, so at first it is determined the area where this phenomenon occurs and then the external source providing the flowing is determined. For modification the penetration model of active material in two dimensional square lattice, which consists of leaking or leakless connection points, will be as follows. In zero time all joints of the lattice are leakless but further the source replaces leakless points with leaking ones and the number of leaking joints increases stepwise. Thus replacement happens in a random way, that is the choice of any of the replacing joints is equiprobable for all surface of a lattice.

The moment of appearance of this lattice condition, when at least one continuous way through the neighboring joints is feasible, will be called as percolation filtration [3]. Leaking and leakless joints are suitably denoted by zeroes (0) and numbers (1). Binary matrix corresponds to the two-dimensional medium. The chain of replacing of zeroes (0) for numbers (1) corresponds to leaking. The matrix is a leaking system at zero time.

0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Leaky elements are added when passing modifying agent in the matrix, but at the beginning their quantity is not sufficient for the percolation filtration.

0	0	0	1
1	0	0	0
0	0	1	0
0	0	1	0

Increasing the number of leaking joints the critical moment is appeared, which is the percolation filtration.

0	0	0	1
1	1	0	0
0	1	1	0
0	0	1	1

There is a chain of elements, as it is seen from the left to the right edge of the matrix, which provides the leaking though leaking points, represented by continuously consecutive units. Let's assume that the joints can be of two types: integral and broken (blosed) [4]. Distribution of integral and broken bonds in the lattice is random, the possibility that this connection is integral is equal to x . Let's assume that it does not depend on condition of neighboring bonds. Two joints of the lattice is regarded as interrelated if the chain of complete bonds connects them. At small values of x the joints are, as a rule, far from each other and clusters from a small amount of joints dominate, however with the increase of x the sizes of clusters sharply increase. The percolation threshold (x_c) is the value x , when the cluster from the infinite number of joints occurs for the first time. Percolation filtration allows to estimate the threshold values of x_c , and investigate the topology of large-scale clusters nearby the percolation threshold.

Having applied this model for compatibility of the modified crushed vulcanizate with a matrix, there was established that for increase of interphase interaction, it is necessary to provide high concentration of an additive on the boundary.

The increasing of properties is observed due to the formation of interfacial area. Using the method of

condensation, we obtain the transition from compatible to incompatible condition, and using the method of dispergating, we obtain the model of transition from incompatible to compatible condition. Having counted data of a state on mathematical models, it is possible to set authentically modification limit, structure of the modifying additive and its distribution in a matrix.

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