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Correlation of physical-mechanical characteristics composition power materials

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Abstract

The purpose of the present article is a qualitative analysis of correlative ratios between physical-mechanical characteristics of the composition power materials (CPM) of various rated basic compounding at a variation of prescription geometrical factors. Physical-mechanical characteristics of composition power materials (durability σ, elastic modulus E, the ultimate strain of ε, etc.) are formed by a complex physical and chemical properties of components and structure of the filled compositions. The most important geometrical factors of CPM are: structure and properties binding; relation of the common volume ratio of a solid phase (φ) to the maximal filling (φ_m); similar characteristics for separate types of excipients; values of thresholds of a percolation ($\varphi_{кр}$); characteristics of interaction between an excipient and polymeric matrix. Physically reasonable empirical ratios connecting the relative elastic modulus and the relative deformation of the filled compositions with the relative degree of admission of compositions are so far constructed. The normalization of values of the module and deformation is carried out with use of similar characteristics (E_o, ε_o) the baked binding. Strongly non-linear, but the monotonic nature of dependences of E/E_o and $\varepsilon/\varepsilon_o$ from the geometrical factors including the relative degree of admission of φ/φ_m allows to assume the monotonic dependence between an elastic modulus and deformation of compositions of CPM (taking into account influence of content of curing agent and change of dispersion of excipients on condition of $\varphi \approx const$).

As far as this dependence is unambiguous and steady against change of the listed factors of influence and is a subject of the real work. Also the correlation assessment in couples of variables durability - an elastic modulus and durability deformation of CPM is carried out. It is shown that for the CPM wide group on the basis of inert and fissile binding the unique monotonic are observed with values of coefficients of correlation, high on an absolute value, and determinations of dependence between an elastic modulus and deformation. The received correlations show a perspective of independent regulation of these two characteristics and confirm effectiveness of paths of modification of basic rated compoundings of CPM for ensuring necessary level of physical-mechanical characteristics.

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