SYNTHESIS OF ULTRAFINE OXIDES POWDERS BY PA CVD

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The process of synthesis of ultra -dispersible powders of metal oxides of (Al, Zn, Mn, In, Ga, Ge) in a steady flow of oxygen RF-plasma (13,56 MHz, power 1kW) was explored at low pressure. The optimal technological parameters of a precipitation process of finely divided powders are spotted. The fugitive coordination compounds β-diketonates of the relevant metals was utilized as precursors in this process. By methods of the physic-chemical assaying is fixed, the finely divided powders of stoichiometrical composition are synthesized which average the size 20±3nm. The particles of powders have the spherical molding box. Their specific surface is equated approximately 24 m^2/g. The Auger-spectroscopic analysis has shown absence in metal-oxide powders of any impurities (admixtures), including carbon. The offered method can be utilized for obtaining of metal-oxide powders, including high melting, and also of powder multi-component systems.

The formation ultra- of dispersible bridging with a high degree of homogeneity and homogeneity provides plasma-chemical synthesis. Thus it is possible to expect for embodying of some features, characteristic for ultra - dispersible condition, which were earlier experimentally fixed for various substances obtained by a plasma-chemical method, in particular of size effect of depressing of sintering points of separate high-melting materials, and also intensification of diffusive processes (2,3).The practical application CVD (4) for obtaining of dimensional finely divided powders of oxides of metals, (together with nitrides) guesses use of all advantages given this method.

The properties of oxide powders are defined by all plurality of parameters, modes and configuration of used setting (temperature, pressure, configuration of fields, chemical and phase composition of reagents etc.). With the purpose of carrying out plasma-chemical of low-temperature synthesis ultra- dispersible powders, the trial type designed, which block diagram is submitted in a fig. 1. Blocks of power supply, the generators and coordination represent modified clusters of setting MB-1,5 of a manufacturing. The module of synthesis of powders is an original construction and represents plasma-chemical a reactor of a flowing type of the cylindrical molding box with capacitate initiation of plasma discharge. The voltage of power supply makes 1300 In with reference frequency 13,56 MHz. composition of powders close on stoichiometry to settlement. The complete set of technological instrumentation includes also devices for refrigeration and separation spray of a stream located in bottom of setting.

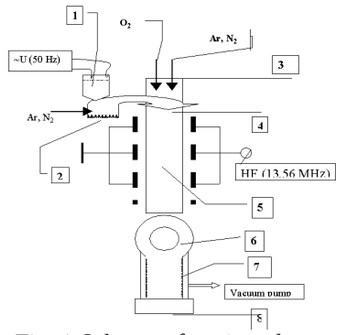

Fig. 1 Schema of setting plasma- chemical HF-synthesis ultra- of dispersible powders:
1-vibro- batcher; 2-heater; 3- knots of input of reactionary gases; 4- inputs of initial reagents; a 5-reactor; 6- coolers; 7-packed bed; 8-receiving tank

By method of Auger-spectroscopy (the spectrometer JAMP-10S) was fixed, that the composition of synthesized powders is close to stoichiometrical. The assaying was carried out on coldly extruded tablets from powders of the relevant oxides.

Results of the explorations which have been lead with the help of the translucent electron microscope JEM 100CX, has allowed to make deductions, that the particles of powders have the correct round molding box and average size 20±3 nm (5).

At reception of ultra dispersible powders by plasma-chemical crystallization in this reactor, it is possible to confirm adequacy of processes, occurring in it that theoretical mechanism, which was guessed in theoretical model operation (5), only by results of exploration of the dispersible characteristics of obtained powders. In the table 1 the results showing conformity of effective diameters of particles, specific areas of surface of these powders and effective diameters of particles designed on gauged values of specific surface are given.

The good conformity of the surface characteristics of received(obtained) powders to their linear characteristics reflects a minimum unsoundness, i.e. stationarity of electrical and stream-oriented processes in a band of response and embodying of mechanisms of synthesis of powders in requirements of plasma discharge.

Thus, as a result of the carried out works designed and are installed experimental of setting low-temperature of HF-plasma chemical synthesis of ultra dispersible powders. The optimal technological modes of synthesis of ultra dispersible powders of oxide of zinc, aluminium and indium by the size 20±3nm were spotted. Is shown, that plasma-chemical technologies using as initial reagents volatile coordination compounds, is the effective and perspective direction of synthesis of high-dispersed powders of function materials.

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