THE TECHNOLOGY TO OBTAIN NANOPOWDERS BY EVAPORATING BASIC MATERIALS

Description
New technology of nanopowders synthesis by the evaporation method with aftercooled high-temperature steam and condensation was elaborated. An industrial electron continuous accelerator with power up to 100 kW with the system of beam focusing while exhausting to atmosphere is used. The equipment allows obtaining temperatures in materials, which are sufficient to evaporate any known heat-resisting materials with heat temp higher than 1000 degr/s. The powders obtained composed from amorphous nanosized particles have features significantly different from ones of the basic material and assure their wide application.

Technical appraisal and economic benefits
The process is ecologically pure as opposed to nowadays industrial ones where chloride, fluorine, acids, silicon tetrachloride and other chemically active, dangerous and poisoning liquid and gaseous substances are used. The advantage of the method proposed is considerably less number of technology stages.

It is possible to organize production of nanosized powders by the technology suggested, for example dioxide and silicone dioxide (SiO$_2$, called "TARKOSIL", SiO), magnesium oxide (MgO), aluminum oxide (Al$_2$O$_3$), titanium oxide (TiO$_2$), yttrium oxide (Y$_2$O$_3$), gadolinium oxide (Gd$_2$O$_3$), metals: tantalum (Ta), molybdenum (Mo), aluminum (Al), nickel (Ni), argentum (Ag) and some others in different ambiences; semiconductors: silicone (Si); aluminum nitride (AlN), titanium nitride (TiN), and other substances. "TARKOSIL" and nanopowders of other substances are the base to create wide range of new materials, including for nanoindustry. The materials obtained have some unique features and characteristics and are needed to create new technologies, machines and apparatus.

Application areas
Silicon dioxide nanopowders "TARKOSIL" can be used as:
- modifiers for paint materials, filling compounds of composite materials, in particular of white and colored rubbers and sealants at different bases, component of fire extinction means, fillers for tooth past;
- dispergator of lumpy products, varnish and lacquers manufacturing, etc.

Development stage
A test-industrial plant is designed. The plant productivity of silicone dioxide nanopowders is 6-7kg/h and at continuous work it is 40 tones a year with power of 70kW.

The tests of variable test-industrial installations were done in order to obtain different powders and were studied their physico-chemical and application characteristics.
Patent protection
The development is patented in the RF (1994).

Commercial offers
- organization of co-production;
- product exportation..

Estimated cost
The expenses for creating of test-industrial production are 200 million rubles. The equipment is produced in the Russian Federation. Approximate pay-off period is two years.

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