Measurements and metrology for RUSNANO projects directed to development of nanotechnologies and the nanoindustry

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Abstract

Nano-measurements and metrology is considered as the important support for RUSNANO commercialization of nanotechnology projects with high business potential and/or social benefit. There are some principal needs which the metrology provisions are targeted on. At the first, the Corporation bases on the competitive measurements and tests at the scientific and technical own expert evaluation of the investment projects minimizing risks at their implementation. Secondly, the metrological provision plays a key role for certification of nanoindustry products and nanotechnologies conducted by Corporation. The reliable nano-measurements should provide an objective and independent evaluation of nanoindustry products according to sufficient number of specific parameters. It should ensure the stability of these parameters in transition from small-scale manufacturing to serial production. Thirdly, the innovating nanotechnologies should be equipped by reliable measurement instruments with resolution at nano-scale. Also the precision nano-measurements should support the development of national and international standards for nanoproducts.

The following three directions of developing new measurement instruments are very actual for needs of nanotechnologies and nanoindustry. The most important one comprises the developments of precise spatial, from 1D to 3D, nano measurements and measurements of physical-chemical characteristics specifying nanomaterials at a nano scale. For instance, the actual problem of nowadays is the precise and reliable measurements of dimensions by various microscopy types in the range of 10 to 1 nanometer. Other examples of actual needs in measurements are associated with quality identification and quantity measurements of carbon nanotubes, nanoparticles and nanocrystalline materials. Another field of new instruments should be intended for express and reliable nano measurements and tests for very spread usage at test laboratories. Such instruments will be oriented on certification tests of mass products and should allow to be exploited by not so high qualified personnel. Also these instruments could be used for education programs at universities and institutes. One else field of measuring instruments will equip the nanoindustry with intelligent systems to guarantee high quality and reliability at mass production. Such systems should be based on metrological assurance in-process and on-line, metrological self-diagnostics and methods for testing of long lifetime sensors. Any case they are needed in reliable algorithms and software.

To get the goals under discussion the Corporation develops two activities including support the projects aimed on production of instruments for nano measurements and creation of the self metrology service.