

**Mikhail Ivanovich Musatov (on the eightieth anniversary of his birth)**

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November 17, 2010 marked the eightieth birthday of Mikhail Ivanovich Musatov, doctor of technical sciences, recognized throughout the world as a specialist in the technology of single-crystal growth, developer of the “GOI method,” a progressive, widely used, and internationally recognized method of growing large crystals of optical synthetic sapphire.

The path to science for Mikhail Ivanovich was long and hard. In 1948, he graduated from trade school, then served in the army, worked at the Novokuznetsk Metallurgical Plant, and studied at night school. In 1958 he entered the Leningrad Polytechnic Institute, and, after graduating in 1963, he was assigned to the S. I. Vavilov State Optical Institute (GOI) (Branch 1) in the laboratory of F. K. Volynets in a group growing single-crystal ruby. He defended his candidate's dissertation on the growth of large ruby crystals by the Czochralski method in 1970. Further progress in this work led to the development of a method of growing large crystals of optical synthetic sapphire, called by Musatov the GOI method, which was the basis of his doctoral dissertation (1979).

The features of this method consist of growing crystals with an unusual, sharply convex shape of the crystallization front under conditions of low temperature gradients in the working zone. The practice of using Musatov's GOI method conflicted with established opinion and theoretical assertions that high-quality crystals can be grown only with a flat crystallization front and that high quality of the crystals could not be achieved at low temperature gradients. It is the implementation of low temperature gradients inside the crucible that made it possible to obtain large crystals with unusually low residual stresses.

The GOI method was used to grow sapphire crystals up to 500 mm in diameter (1983). The method created by Musatov makes it possible to substantially reduce the power required by a single mass of as-grown crystals. These crystals excel the competition in quality, size, and manufacturing cost.

Musatov developed high-efficiency equipment for the mass growth of synthetic sapphire crystals from 120 to 350 mm in diameter in high vacuum or in an inert atmosphere at a temperature above 2050 °C. He organized the commercial production of furnaces of type Omega, Ikar, SZVN, APEKS, etc. in Luganska, Taganrog, and Kolpino. With the active participation of Mikhail Ivanovich, this equipment was introduced into the leading enterprises of our country (Factories ÉLMA in Zelenograd, ÉMITRON in Moscow, Analog in Stavropol, the Stavropol Factory of Chemical Reagents, etc.). The technique and technology created by Musatov has become adopted not only in Russia, but



in a number of foreign countries, such as the USA, China, Taiwan, Poland, Israel, Ukraine, Uzbekistan, Armenia, France, etc. The GOI method is used today to grow almost half of the entire world's production of synthetic sapphire crystals up to 300 mm in diameter and mass up to 80 kg, with the main part of them being produced in Russia.

The scientist's latest, unimplemented developments make it possible to grow sapphire crystals up to 1000 mm in diameter or more with substantially reduced expense per unit mass of crystal.

Mikhail Ivanovich Musatov is the author of about 100 publications and has more than 30 inventor's certificates and patents. He is currently preparing for publication a monograph that will explain in detail not only the technique and technology of the GOI method, but also the history of their appearance and development in a severely competitive battle with their main opponents—the Institute of Crystallography of the Academy of Sciences of the USSR (Moscow) and VNIIMonokristallreaktiv (Kharkov).

His colleagues, friends, and confederates congratulate Mikhail Ivanovich Musatov on his birthday and wish him good health and further success in his hard work.