Most branches of modern technology require materials which meet high standards with respect to electrical insulation and chemical stability, and have the capacity to work at high temperatures under mechanical loading.

A material which combines a whole range of different properties is glass fiber and the materials derived from it. In the last ten years the technical methods of combining glass-fiber materials with polymers have been widely developed and the range of properties necessary for contemporary technology has been extended even further. This has produced a rapid extension in the industrial production of both glass fiber itself and composites made from glass fiber and plastic, the glass laminates.

Towards the end of the eighth Five-Year Plan enough materials and goods from glass fiber and glass laminates were being produced in the Soviet Union largely to satisfy the demands of the key branches of our domestic economy. The production of glass fiber has increased in the last five years by two and a half times, and that of glass laminates by almost three times. The Soviet Union is now the second largest producer of glass fiber in the world.

During that period, technological processes were developed and introduced which enabled this production to reach new high technical levels. A glass composition with a strictly standardized alkali oxide content (~ 0.5% instead of 2%) was developed and introduced into the industry. This was invaluable in achieving a higher quality for the glass-fiber articles used in electrical insulation. A series of glasses with special properties for the provision of fibrous materials with high physicochemical characteristics were developed.

Glass-melting furnaces with 400-bush assembly and furnaces with a high output, which has made it possible to increase the electric-furnace productivity by more than 50% and to raise significantly the productivity of labor in the production of some types of primary filament, have been developed and are now in production. Winding apparatus which will improve the packing of the primary fiber has begun to be introduced into the industry. Direct lubrication of the composition is also being introduced for some types of textile goods and materials made from continuous fiber. These and several other technical measures have made it possible to increase the productivity of the electrical furnaces by 15-25% in the 200- and 100-bush furnaces.

A significant reduction in the consumption of precious metals has been achieved by the replacement of these in part by less scarce and cheaper materials but without any significant reduction in the fundamental physicochemical characteristics of the fiber.

Considerable changes have been made in the variety of the materials produced. The industrial production of multilayered and contoured fabric has been organized. Continuous production has been set up of a range of glass fabric made from continuous fiber for the filtration of gasses, neutral or chemically corrosive media in the chemical and metallurgical industries and in the production of cement and carbon black.

Research on the development of high quality filter materials using staple glass fiber intended for textiles and bulk textured glass filament has been successfully completed.

*Implementing the Decisions of the XXIV Congress of the CPSU.
Production engineering development for nonwoven materials such as knits, advanced chemically bonded high density materials and thin nonwoven nets which reduce considerably the cost of reinforced materials for glass laminates, has been undertaken.

The industrial production of decorative materials based on glass fabrics has been organized. These fabrics are produced in plain colors or in patterns.

One of the most important scientific and technical achievements has been the development, mastery, and the imminent introduction in 1971 of the technique for producing some types of reinforced materials from continuous glass fiber using a single-stage method. Next year this method will become the principal production method for reinforced materials for the mass production of glass laminates. The technical and economic advantages of this method will open up the possibility of continuous production of cheap reinforced materials.

A new technique has been developed for the production of staple glass fibers with a diameter of 0.5 μ or less.

The production of pressed materials such as AG-4NS, DSV, and some other forms of glass-filled thermoplastics has been set up. Pilot plant production of glass-laminate pipes for the chemical industry has been organized.

In some plants, the continuous production of small boats made of glass laminates, dinghies, sloops, and launches, has been set up. The production has been successfully mastered of semirigid decorative materials based on glass fabric for domestic use, of light transmitting, flexible glass laminates for use in horticulture (instead of glass in forcing beds and greenhouses) and continuous semirigid glass laminates for constructional purposes. Some plants are successfully producing on an industrial scale goods in wide demand made of glass laminates (reels, telescopic rods, and other types of sports goods).

The ninth Five-Year Plan places even greater tasks before the scientists of the Institute and the workers in the glass-fiber and laminate industry. With a relatively small capital expenditure, the volume of production of glass fiber and laminates must be doubled during 1971-1975; the variety of goods and materials must be extended and their quality improved and cost reduced.

In order to solve these problems it is necessary to intensify the existing production and to introduce highly productive technological processes, to mechanize and automate production.

The development of highly productive multimachine installations for the output of glass beads will make it possible to double the productivity of labor, to halve the fuel consumption, and to improve the use of the production areas.

The setting up of a new glass spinning assembly, the SPA-4, with an increased packed weight of 2 kg has made it possible to increase by 50% the labor productivity in the production of continuous glass fiber.

A design has been produced for a small glass-melting furnace with a larger number of bushings (600, 800, and 1200) and the technique of producing fiber with a diameter of 5-7 and 9-11 μ will increase the productivity of the equipment by 50%.

The successful mastery of the techniques and the installation of equipment for the production of continuous textile glass fiber and glass wool from continuous filaments by a single-stage method will make it possible to increase productivity by 150-200%, to improve the quality of the product, and to lower its cost significantly.

Another problem will be to reduce the quantity of the platinum in glass-melting equipment by 50-60% down to the 1965 level.

The production of new equipment for the textile treatment of glass fiber, the changeover in the industry to new highly productive winding machines, like the TKS-132-1 and the RKS-132, with a packed weight of up to 1 kg, the industrial use of shuttleless weaving looms, will all result in a significant increase in productivity and an improvement in the quality of the product.

The development of an industrial technique and the equipment for the production of chemically bonded nonwoven reinforcing materials for glass laminates will ensure a fourfold increase in the productivity of labor, will reduce the power consumption of the process by a third, and will reduce the area required for production by 40%.  

522