Satisfying the requirements of enterprises and institutes for standard composition specimens is a complex task not only from the metrological and analytical points of view but also because of the complexity of the task of harmonizing and carrying out all the stages in the work both within the institute which is turning out the composition specimens, and in the large group of organizations which take part in their manufacture.

The main problems which must be solved in the output of standard composition specimens are:

1. Studying the need for standard specimens in enterprises manufacturing and using the materials of the branch of industry which is being served, and developing on this basis long-term and annual plans for turning out specimens in the necessary quantity and assortment.

2. Solving the methodological questions connected with the manufacture of standard specimens, publishing the necessary norm documentation, and also developing methods of preparing material and carrying out chemical and spectral analysis in order to attest the specimens.

3. Preparing the material for standard specimens, establishing their chemical composition, and carrying out other scientific research work necessary for the manufacture of the specimens.

4. Coordinating scientific research work on the manufacture of standard specimens in organizations participating in their manufacture together with the principal organization.

5. Informing organizations about the output of standard specimens, and satisfying their orders.

In order to fulfill these tasks in an institute which manufactures standard specimens for chemical and spectral analysis, at least three main departments are necessary: the technological, chemicoanalytical, and spectral analysis departments.

An account is given below of the experience of the All-Union Scientific Research Institute for Standard Specimens (VNIISO) of the USSR Ministry of Ferrous Metallurgy in organizing the manufacture of these specimens.

In VNIISO the technological department has been given the task of studying the needs of enterprises for standard specimens, developing long-term and annual plans for manufacturing them, casting and preparing the material for standard specimens, and also informing enterprises about the specimens manufactured and meeting their orders.

The chemicoanalytical department carries out chemical analysis on the specimens, coordinates the work of the organizations participating in the analysis, carries out the mathematical processing of the analytical data obtained and establishes the composition of the specimens, and also develops and refines methods of chemical analysis.

The spectral analysis department, in conjunction with the technological department, works out technical conditions and requirements for standard specimen materials for spectral analysis, checks the homogeneity of these materials, develops and refines methods of spectral analysis for the specimens, establishes the mutual conformity of the specimens, and also studies the factors which determine the sphere of possible application of the samples.

It is particularly important to choose the optimal plan of manufacture, which must on the one hand ensure that standard specimens manufactured earlier and used up are replaced, and on the other hand ensure that the catalog list of standard specimens is extended to take account of the materials which are most important for the metallurgical industry. The inclusion in a repeat production plan of one or another standard specimen is determined by


whether or not the reserves of it in the institute have been used up. The output spacing for standard specimens of the carbonized steels and cast irons which are in the greatest demand is 1-2 years, for alloyed steels and ores on average 5 years, and it is only for some individual types of material that the interval between outputs can be increased to 10-15 years. In practice at VNIISO the repeat production of specimens amounts to about half the total quantity of list items manufactured annually. This makes it possible to satisfy up to 80% of orders from organizations.

Among the standard specimens first developed the principal place belongs to the materials of ferrous metallurgy, especially composite-alloyed steels and alloys. The institute also manufactures some nonferrous alloys on aluminum, copper, and titanium bases.

As a rule, the manufacture of new standard specimens is a component in fulfilling one of the complex subjects. To these subjects one may relate, for example, the development and manufacture of standard composition specimens of nonrusting, heat-resistant, and precision alloys. It included a number of scientific research studies on applying ion-exchange chromatography to separating the components of complex composition alloys, on the use of organic reagents for analytical purposes and on developing methods for detecting vanadium, zirconium, tungsten, molybdenum, niobium, and cerium when they are present together in this group of alloys. In the spectral analysis department laborious work is carried out on developing methods and investigating specimens intended for spectral analysis. This has enabled the Institute in the last 5 years to manufacture 84 new standard composition specimens of composite-alloyed alloys, including 18 sets of specimens for spectral analysis.

The manufacture of standard specimens for this group of alloys still remains one of the main tasks of the Institute for the future. In 1968 work was practically finished on two sets for spectral analysis and five specimens for chemical analysis; in 1969 work will be done on three sets for spectral analysis of precision alloys.

The second great task the solution of which has occupied the workers at the institute in recent years is the creation of a system of standard specimens for detecting small concentrations of harmful nonferrous metal impurities in ferroalloys. Standard specimens have been manufactured for detecting these impurities by chemical analysis methods in ferromolybdenum, ferrowolfram, and chromium, and similar specimens are at the development stage for ferrotitanium, carbon-free ferrochromium, ferroboron, and ferroniobium. A set has been manufactured for the spectral analysis of chromium, and a set is being prepared for ferromolybdenum.

Considerable efforts were required to develop standard specimens for the automated spectral analysis of ferrous metals by the use of vacuum photoelectric apparatus. At the present time ways are being sought of perfecting methods of preparing and studying these specimens; a number of institutes and metallurgical plants are involved in this.

In order to supply timely information, all interested organizations are sent the draft production program of the specimens for the following year. The replies of the organizations and their orders contain remarks on the catalog list. The production plan, refined as a result of these remarks, is considered by the scientific and technical committee of the institute, is harmonized at the coordination conference of ferrous metallurgy institutes, and is presented for confirmation to the USSR Ministry of Ferrous Metallurgy.

This system for working out the list plan makes it possible to check the reasonableness of including in the plan each of the projected specimens, to evaluate more accurately the total demand for them, and to elicit the main observations of the consumers on the planned list.

More than 90% of the material of standard specimens for chemical analysis enters the institute in the form of metal billets. So in order to speed up the manufacture of the samples it is important to intensify the production of shavings on lathes without lowering their quality. To this end optimal steel cutting procedures have been worked out for cutting steel of various different sorts with elongated chasing tools, and a number of new methods have been introduced for preparing metal shavings. In order to increase the output of specimens for spectral analysis it is necessary to have one's own metallurgical base.

In the whole cycle of work on manufacturing standard specimens the greatest difficulties are occasioned by the organization of the main stage—the establishment of the chemical composition of the specimens. The explanation for this is, on the one hand, that it is necessary to carry out laborious preliminary studies on working out, refining, and selecting methods of analysis, and, on the other hand, that establishing the composition of each specimen requires the combined efforts of a number of laboratories.

The main form of mutual relations between VNIISO and the organizations participating in the manufacture of specimens is direct agreements, providing for volumes of work, technical conditions for carrying them out, and com-