State Standards 7875-66 provides for the testing of normal-size bricks. Smaller goods cannot be tested for thermal stability.

Resistance to the action of slag at service temperatures and abrasion at elevated temperatures are factors which were not taken into account in quality tests. In preparing new State Standards the duty of refractories as well as testing time and complexity should be given adequate attention. The new testing methods should be carried out automatically.

At Semiluki Refractory Plant a project is under way to introduce rapid and accurate methods for production control and certification. A statistical method for the determination of apparent density, porosity and compressive strength was elaborated in collaboration with the All-Union Institute of Refractories. A frequency meter for mechanical oscillations is used for measuring. The statistical method is applied at the plant in preparing certifications for normal, sleeve, checker (chamotte and high-alumina) and cupola bricks. Work continues on the application of that method to the certification of other types of brick including blast furnace brick. The statistical method has the advantage of classical method in that it allows property determination of the entire brick and not only of a part of it. Therefore, it characterizes the property of refractories to a much larger extent. The statistical method allows the increase of test pieces without destruction and gives a more accurate evaluation of a batch of refractories. For five years the Semiluki Plant has been preparing certifications and this experience facilitates the assessment of the material and the mathematical calculations in elaborating draft standards.

The available experimental data are commended to the attention of the All-Union Institute of Refractories in designing a new method of testing compressive strength, apparent density and porosity by determining the frequency of oscillations of the article.

The large-scale production of instruments for the introduction of the statistical methods at all refractory plants is also recommended. A more powerful panel for the apparatus should also be designed and quality control by sound method elaborated for specially intricate 20 to 300 kg refractories.

Problems concerned with the mechanization and automation of laboratory tests for quality control and certification have not been given adequate attention by laboratories. Sampling, the preparation of specimens and testing require considerable physical effort. A system of complex automation of quality control including sampling is still to be elaborated. It is up to the research institutes to assume the responsibility.

It does not seem absolutely necessary to specify the initial softening point of ladle brick. The refractoriness of aluminosilicate refractories should be determined. The practice of the Semiluki Refractory Plant proved that by using raw material from the same deposit and with an invariable production process the calculation of refractoriness is more reliable than tests according to State Standards 4069-48.

Certifications on the technical properties of refractories according to a given production process should be prepared by each refractory plant. This practice would greatly facilitate the certification of refractories and enhance the responsibility of refractory plants for the quality of their goods.

BOOK REVIEW

"DINAS BRICK"

I.S. KAYNARSKYI
Metallurgizdat, 1961

This monograph deals with dinas refractories. The author discusses the physical and chemical properties as well as the practical aspects of the production and use of dinas bricks.

In the chapter "Physical and Chemical Bases and Production Process of Dinas Brick" silica minerals are discussed along with such problems as physical and chemical systems of silica with different oxides, conversion of silica properties of silica rock, binders, the preparation of dinas mixtures, the processes that occur during pressing, drying and burning of dinas brick. The author is the first Soviet writer to give a detailed account of the new silica inoculants coecite, citite, silica W and silica O and report on the existence of two inoculants for low-temperature tridymite, i.e. stable inoculant S and metastable inoculant M. The mechanism and kinetics of silica conversion are also explained in that chapter. The discussion of outside ions as a decisive factor in the diffusion mechanism of silica conversion is a novel approach to the problem. The author considers the melt as a means to supply cations to the solid phase. He notes, inter alia, that there is no consensus on the mechanism of crystobalite conversion to tridymite.

The part of the book on the physical chemistry of silica closes with a discussion of the silica system in combination with various oxides and their importance for dinas production. Then, the author describes the physical and chemical processes that occur in the production of dinas, in general with a particular emphasis on pressing and firing.

The physical, chemical and technological data in the book are primarily a generalization of all aspects of Soviet Dinas production and of numerous investigations carried out in the Soviet Union over the past thirty years.

The chapter "General Dinas Brick Production" discusses the preparation of raw material, aggregates, powders and mixing techniques. It also deals with pressing, drying

of semi-finished products and burning. The practical data given in that chapter are of considerable value and should be used in both the planning and practice of Dinas brick plants.

The chapter "Special Dinas Brick Production" goes into Dinas brick for open-hearth, electric, coke and glass furnaces and dwells on the features of the process which allow the production of high quality dinas brick for that purpose. The production of high-density dinas brick and all types of dinas in combination with chromite, zirconium, carborundum, concrete, mortar, light-weight and unburned dinas and even dinas made of raw material like vein quartz, zuartz sands, chalcedony and quartz glass. The effect of the characteristics of a production process on quality is discussed in great length for each refractory.

The author states that in addition to regular dinas brick made of quartzites, new types of dinas refractories with a wide range of properties can be manufactured; it is possible to produce zirconium dinas brick, for instance, with a higher initial softening point or dinas carborundum brick with greater thermal stability.

The next chapter "Properties of Dinas Brick" investigates the properties of these refractories, their correlation and the factors that determine their physical, chemical and technological properties. The part that deals with the effect of solid, liquid and gaseous phases on Dinas brick is noteworthy.

The concluding chapter "Use of Dinas Brick" describes the duty and wear of dinas in different furnace units.

The monograph gives a detailed and thorough insight into all aspects of dinas production and use. The author referred to a great variety of foreign sources on Dinas brick (the bibliography contains over 1000 references). However, the following shortcomings should be pointed out:

1. The first chapter should have been subdivided into (a) general physical and chemical basis of the production process and (b) physical and chemical bases and processes of individual operations in the production process.

2. In discussing the ternary system of $SiO_2 - FeO - Al_2O_3$ the author claims that ferrous oxide has greater fluxing properties than magnetite. However, the fact that Al_2O_3 destroys the immiscible liquids in the $FeO - SiO_2$ system and, consequently, the liquid phase increases, is omitted. Since this fact is of considerable importance for the service life of Dinas brick it should have been indicated.

3. The heat capacity of wustite, hematite, fayalite etc. (see p. 370) could have been eliminated because their negligeable presence in Dinas brick does not affect the heat capacity of that refractory.

4. In investigating the interaction with solid, liquid and gaseous atmospheres it would be interesting to learn about the effect of alkaline vapors on dinas (the papers by Rowden and Green, for instance) a factor which is significant for the life of Dinas brick in coke and glass furnaces.

5. In discussing the durability of Dinas brick in glass furnaces the author omits any mention of the fact that in the manufacturing of boron silicate glass the wear of Dinas brick is greater than in making alkaline glass because it is produced at higher temperatures (by 150 to 200°C).

In our view the title "Formation of the Dinas Body" (Chapter 1) should have read "Forming of Dinas During Heating" while "Forming the Green Material" should have been more appropriately called "Pressing of Dinas Mixtures" (Chapter II).

The above shortcomings do not diminish the great value of the paper which is written on a scientific level and is marked by a profound and versatile discussion of the theory and practice of Dinas brick production. The paper is recommended for investigators, planners and production personel. There is no doubt that it will enhance the level of scientific knowledge with regard to the physical chemistry of silica refractories.

Reviewed by V. A. Bron

ARTICLES PUBLISHED IN OGNEUPORY

1933 Nr 4. Effect of Limestone and Grain Distribution on the Properties of Dinas Brick.
Nrs 6-7. Fuel Consumption in a Lengersdorf Tunnel-type Furnace.

1934 Nr 8. Effect of Additives on the Properties of Dinas Brick.
Nr 12. Linear changes in Dinas Brick During Firing.

1935 Nr 4. Dinas Brick with Whitewash Binder.
Nr 7. Abnormal Behavior of Tarasov Sandstone During Firing.
Nr 9. Unburned Reinforced Suspension Roofs for Open-Hearth and Electric Furnaces.

1937 Nr 8. Tarasov Sandstone in Dinas Brick Production.
Nr 12. Investigation of Dinas Expansion During Firing (first article)

1938 Nr 9. Investigation of Dinas Expansion During Firing (second and last article)

1939 Nr 9. Determining the Suitability of Raw Material for the Production of Dinas Brick and Refractory Silica Mixtures.