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TECHNOLOGY OF RECEIVING FLUXED IRON MATERIAL FOR BLAST FURNACE WITH THE RAISED CONTENT OF IRON, COMBINING THE BEST METALLURGICAL CHARACTERISTICS OF SINTER AND PELLETS

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INTRODUCTION

The main trends in the blast-furnace smelting of iron were identified in the last century. They include increase in furnace capacity; increase in blast temperature; oxygen enrichment of the blast; increase in pressure of the blast-furnace gas; injection of natural gas, coke-oven gas, fuel oil, and pulverized coal into the furnace; optimization of the batch distribution at the charge hole by means of new charging systems; improvement in gas-flux distribution in the furnace hearth; and automation of the smelting process.

These innovations are being introduced in practice. Scope for increasing furnace capacity has been exhausted: 5000–5500 m^3 is sufficient in both technological and economic terms. The Kalugin shaftless air heater ensures blast temperatures of 1300°C or more. Increase in pressure of the blast-furnace gas, which was not decreased below 250 kPa in the Soviet Union in order to intensify smelting, is most often used today to maintain the optimal static pressure difference of the gas in the furnace. The injection of natural gas, coke-oven gas, and fuel oil has been successfully introduced. The injection of natural gas and pulverized coal in the tuyeres is widely used. Pulverized-coal injection results in excellent blast-furnace performance. Charging systems such as the Paul Wurth tray system and the rotor system permit any required batch distribution at the charge hole. Monitoring of the combustion-zone dimensions and regulation of the gas-flux distribution within the hearth are also well developed. Many problems in the monitoring of the blast-furnace parameters have been solved by current computing systems and new instruments.

The most important approach to improving furnace performance at this point is to provide high-quality batch components (coke and iron ore). We may conclude that coke specialists can produce coke of the quality required by blast-furnace specialists. However, improvement in iron-ore quality is another matter.

1. The analysis of existing methods for solving the problem and formulating a task for the optimal technique development

It is known that for efficient production of pig iron in blast furnaces requires homogeneous fully fluxed (with a ratio equal to 1.25-1.5 CaO/SiO_2 (B) for different conditions blast furnace), agglomerated (particle size 10-60 mm) iron-material with a high iron content as possible and a minimum content of silica[1]. Currently, the major iron-traditional blast furnace charge materials are fluxed (B=1.2-1.3) and sinter – nonefluxed bathtubs or fluxed (B=0,1-1,25) pellets. Each of these materials are presented modern requirements for metallurgical characteristics (Table 1), which they must possess to ensure efficient operation of the blast furnace[2,3].

Besides these requirements are loaded into a blast furnace iron agglomerates materials should also have a uniform distribution of the diameter of the blast furnace, the angle of repose of coke is equal analogous 37-41 degrees. Sinter and pellets have both positive in terms of the blast furnace and negative characteristics.

Positive metallurgical characteristics of sinter are: technological capability to produce it from any ferrous materials and wastes of metallurgical possibility fluxed it to any desired (0.1 to 4.5) basicity (ratio CaO/SiO_2), the angle of repose similar coke, the lowest layer of shrinkage, pressure drop, gas in the layer, and a narrow interval between the onset of softening temperature and melting during high temperature (above 1100°C) recovery[4].

Negative agglomerate metallurgical characteristics are low iron content, high fines content (0-5 mm) in the finished product, a wide size range of finished products, low impact strength and high friability during transportation, low strength and high friability of the low-temperature recovery process, relatively low recoverability.

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Table 1

Modern requirements of domain melting to the metallurgical to characteristics of agglomerate and pellets

Name of indicators	**Agglomerate**	**Pellets**
1. In a cold condition		
1.1. Durability on compression, it is DaN/apprx. GOST 24765-81	–	not less than 200,0
1.2. The contents in shipped production of pellets with durability on compression more than 200,0 the % is DaN/apprx,	–	not less than 90,0
1.3. Factor of durability (+ 5 mm), %. GOST 15137-77	not less than 80,0	not less than 95,0
1.4. Wearability factor (0-0,5 mm), %. GOST 1537-77	no more than 4,0	no more than 3,0
1.5. The maintenance of a trifle (0-5 mm) in shipped production, %.	no more 6,0	no more 3,0
1.6. The fineness of shipped production, % of classes.	not less than 85,0 % of 8-35 mm	not less than 95 % of 8-18 mm
2. In the process of recovery		
Name of indicators	Agglomerate	Pellets
2.1, Durability indicator (+5 mm), %. GOST 19575-74	not less than 50,0	not less than 80,0
2.2. Indicators wearability (0-0,5 mm), %. GOST 19575-74	not less 5,0	not less 5,0
2.3. Shrinkage of the layer when restoring, %. GOST 21707-76;	no more than 20,0	no more than 30,0
2.4. Gas reducer pressure difference in a layer, Pa. GOST 21707-76	no more 150	no more 200
2.5. Actual extent of restoration, %. GOST 17212-84	not less 90,0	not less 90,0
2.6. Reducibility at extent of restoration to 40 %, %/minute.	not less 0,5	not less 0,5
2.7. Temperatures has begun also the end of a softening, °C.	not below 1050 and 1150	not below 960 and 1160
2.8. Temperature interval of a softening, °C.	no more than 100	no more than 200
3. Stability of structure		
3.1. Admissible fluctuations of the content of iron, ± %	0,25	0,25
3,2. Permitted variation of iron oxide, ± %	1,00	0,50
3.3. Permitted variation basicity, ± unit.	0,05	0,025

Positive metallurgical characteristics of pellets are higher than the sinter iron content, a narrow size range, technological ability to produce pellets with any necessary information to the blast furnace basicity ratio CaO/SiO_2) only in the case of iron ore concentrate with an SiO_2 content of less than 5 %, low the content of fines in the final product, high strength and low friability during transportation, high strength and low friability at low temperature recovery process, a relatively high reducibility.

Negative metallurgical characteristics of pellets are technologically impossible to produce pellets required for blast furnace Main (CaO/SiO_2 above 0.8) using iron ore concentrates containing more than 5.0 % silica, low angle of repose, high shrinkage values layer and the gas pressure differential in the layer during high-temperature (1100°C) recovery low core pellets.

Many researchers developed technology to improve the metallurgical characteristics of the agglomerate[5, 6, 7] and fired pellets[8, 9]. However, to achieve the full range of requirements of the blast furnace to the metallurgical characteristics of sinter and pellets, as well as technological opportunities for their implementation was not possible.

Rationally would develop technology to produce new material for agglomerated iron blast furnace, which combines the positive metallurgical characteristics of sinter and pellets and exclude the presence in it of their negative features. The researchers suggest the technology of this product[10, 11, 12]. However, they also have some significant drawbacks.

2. Development of technology for the production of iron ore specs, combining the best properties of sinter and pellets

Authors, given the incomplete compliance technological parameters of the production previously developed new types of agglomerated iron ore

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[12] Сулименко С.Е., Игнатов Н.В., Бочка В.В. и др. Перспективы совершенствования технологии производства гибридного окускованного сырья и его использование в доменной плавке. *Бюллетень НТИ Черная металлургия*. 2003. № 6. 26 с.

requirements for blast furnace complex of its metallurgical characteristics, technology offered a homogeneous chemical and granulometric composition agglomerates fully fluxed iron material with metallurgical characteristics that meet all modern requirements of blast furnace[13, 14].

The studies were conducted in a laboratory setting simulating sintering parameters of sinter and pellet firing (Fig. 1). The essence of the developed processes based on the creation of agglomerated iron material uniform chemical composition and metallurgical characteristics that determines its behavior at the same diameter and height of the blast furnace in all areas: solid-phase reduction, softening and melting. It shall be ensured high durability and recoverability of the material, as well as a narrow temperature interval between the onset of melting and softening, which is important for efficient operation of the lower zones of the blast furnace. In addition, to avoid significant complications production process agglomerated material.

To ensure adequate and controlled size and strength of agglomerated material is necessary to create a layer of green pellets immolation rigid frame of none-melt fusible pellets and melt that will fasten this frame in a piece of a certain size. For this series of tests conducted two different composition blends to produce green pellets with low and high melting point. In the first series of tests used one ore concentrate to obtain a low-melting and high-melting pellets entering into the batch with different additives and amounts of flux, reducing, or increasing, if necessary, the melting temperature of the respective pellets.

In a second series of tests, we used two different depths of iron concentrate enrichment, but refractory and fusible raw pellets had the same basic that it is important to ensure a narrow temperature interval between the start of softening and melting in the reduction in the blast furnace. Furthermore, fusible and infusible charge introduced, if necessary, certain additives to increase or decrease the temperature corresponding to the melting of pellets.

In the first series of tests for a more dramatic differences in melting temperatures of pellets with low and high melting temperatures and, consequently, the more successful their thermostrengthening used two charge: charge for pellets with a high melting point was made from a concentrate containing any value from the range of content 1-10 % SiO_2.

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[13] Спосіб виробництва офлюсованого огрудкованого матеріалу: пат. 84769 Україна; МПК C22B 1/14 (2006.01). № 201307330; заявл. 10.06.2013; опубл. 25.10.2013, Бюл. № 20. 8 с.

[14] Спосіб виробництва офлюсованого огрудкованого матеріалу: пат. 85685 Україна; МПК C22B 1/14 (2006.01). № 201307276; заявл. 10.06.2013; опубл. 25.11.2013, Бюл. № 22. 9 с.

To avoid the formation of low-melting eutectics in this batch flux (limestone or dolomitic limestone) was not introduced.

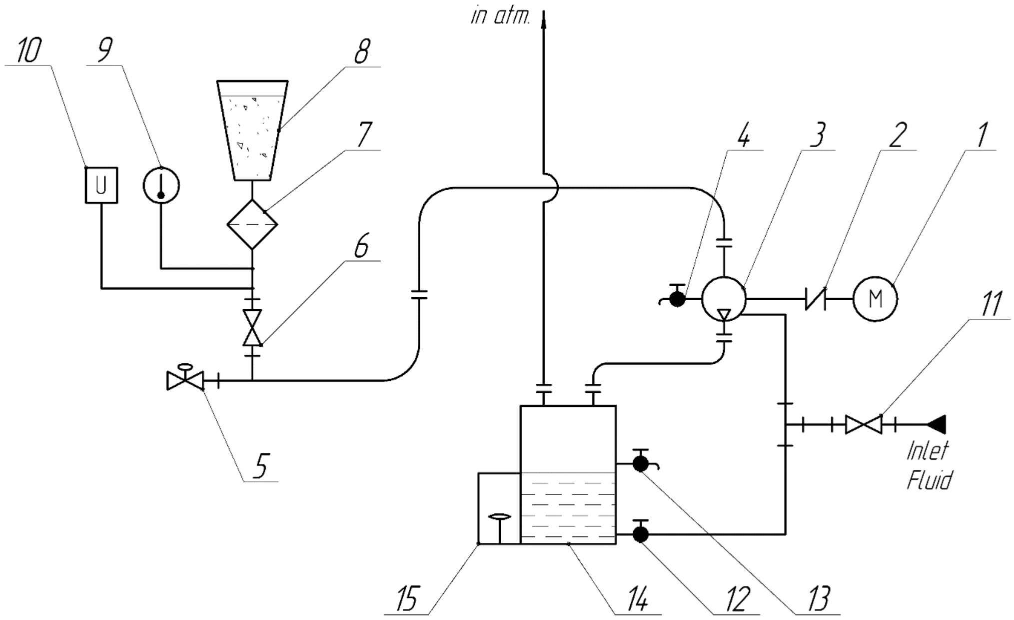

Fig. 1. Scheme of the laboratory setup type bowl

1 – Engine 2 – elastic sleeve, 3 – a pneumatic 4 – hydrant; 5 – vacuum regulator 6 – valve 7 – Filter 8 – glass, 9 – thermocouple; 10 – U-shaped vacuum, 11 – valve, 12 – shut-off valve; 13 – hydrant 14 – tank, 15 – level

For formation during high temperature firing of refractory compounds of this batch were introduced, if necessary, a minimum amount (0-3,1 %) of one of the oxides (MgO, Cr_2O_3, TiO_2) high (over 2000°C) melting the minerals contained in dolomite, chromite, titanomagnetite. Batch low melting point was made from the same concentrate containing any value in the range 1-10 % SiO_2. In all this the charge was introduced amount of flux (limestone only), which is necessary to provide the desired basicity (CaO/SiO_2) just agglomerated material equal 1.25-1.5 units. Due to this charge was formed in the amount of low melting eutectics sufficient to facilitate obtaining the desired amount of local melt bonding none-melt pellets at this temperature with a high melting point.

Putting this in the charge if necessary, a minimum amount (0-0.8 % to 0-1,2 %), respectively, the low-melting compounds and carbon with a solid or liquid fuel to accelerate the melting of the batch. Reduced size of green pellets with a low melting point to 8-14 mm also accelerated their heating and melting, and the increase in size of green pellets with a high melting point to 14-20 mm slowed their warm and did not cause them to melt with a minimum amount of refractory compounds to melt pellets a low melting point.

After high temperature firing and cooling pellets with a high melting point became framed and melted pellets with low melting linked this frame in a durable agglomerated material. Size pieces and their uniformity depended on the proportion of mixed low and high pellets, as well as uniform distribution of low-temperature high-temperature between the pellet pellets. Test results are shown in tab. 2.

In a second series of high temperature and low temperature tests green pellets produced from two different iron ore concentrates, respectively high and low enrichment.

Moreover, for a more dramatic differences in melting temperatures of pellets and hence the more successful of thermostrengthening used two iron ore concentrate: pellet blend of a high melting point was made of a rich concentrate containing 1-5 % SiO_2, and charge a low melting point was made of poorer concentrate containing 5-10 % SiO_2. Use of the concentrate with an SiO_2 content equal to 1-5 % of pellets with high melting minimal amount of flux required for obtaining the required basicity (CaO/SiO_2), therefore constitutes less low-melting eutectics that melt pellets are not allowed at said maximum firing temperature with a minimum amount of refractory oxides. Use of a concentrate containing SiO_2 equal to 10.5 % in the pellets with a low melting point necessitated input to the charge amount of flux greater to achieve the same basicity (CaO/SiO_2) and, accordingly, the formation of low melting eutectics more and more of the primary melt, allowing the pellets to melt fusible with a minimal amount of carbon compounds and in the mixture of fuel pellets.

Table 2

Variable parameters of the process producing agglomerated material

Name indicators	**I. Technology with the identical the maintenance of SiO_2 in a concentrate**				**II. Technology from the identical basicity of pellets**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	2	3	4	5	6	7	8	9
Basicity – CaO/SiO_2, unit. crude pellets with l.m.p.*	8.7	5.1	6.4	4.3	1.25	1.35	1.45	1.55
crude pellets with h.m.p.*	<0.2	<0.2	<0.2	<0.2	1.25	1.35	1.45	1.55
Size, mm: all pelletized material including:	6-22	8-20	4-20	8-22	6-22	8-20	4-20	8-22
crude pellets with l.m.p. crude pellets with h.m.p.	6-14	8-14	4-10	8-14	6-16	8-14	4-10	8-14
	12-22	14-20	14-20	16-22	12-22	14-20	14-20	16-22

Continuation of table 2

1	2	3	4	5	6	7	8	9
Maintenance of SiO_2, % in crude pellets with l.m.p.	10.4	9.8	6.9	5.3	10.4	9.8	6.9	5.3
in crude pellets with h.m.p.	5.7	4.2	3.4	2.1	5.7	4.2	3.4	2.1
The content of carbon in crude pellets, %: with l.m.p.	0	0.5	0.8	1.2	1.6	2.7	3.5	4.2
with h.m.p.	0	0	0	0	0	0	0	0
Gumboil in crude pellets with l.m.p.	lime	lime	lime	lime	lime	lime	lime	lime
in crude pellets with h.m.p.	0	0	0	0	lime	lime	lime	lime
Quantity refractory (MgO, Cr_2O_3, TiO_2) connections, %: in crude pellets with l.m.p.	0	0	0	0	0	0	0	0
in crude pellets with h.m.p.	3.1	2.6	1.3	0	3.1	2.6	1.3	0
Number of fusible connections, %: in crude pellets with l.m.p.	0	0.2	0.5	0.8	0	0.2	0.5	0.8
in crude pellets with h.m.p.	0	0	0	0	0	0	0	0
Quantity in a mix, %: crude pellets with l.m.p.	21	27	25	29	5	13	22	29
crude pellets with h.m.p.	79	73	75	71	95	87	78	71
The maximum temperature of roasting of a mix of crude pellets, °C	1390	1320	1350	1290	1290	1310	1330	1350
Specific productivity, t/sq.m·h	1.25	1.03	1.14	0.9	1.18	1.16	1.08	1.02
Specific expense of heat, MDZh/t	418.7	1047	825.6	1213	527.3	715.7	809.6	948.4
Specific expense of the electric power, kW·h/t	39.4	58.2	48.9	63.7	51.5	58.7	61.3	64.1
The maintenance of Fe_{main} in the ready agglomerated burnt product, %	62.9	63.2	64.0	64.4	63.1	63.6	64.2	64.7

End of table 2

1	2	3	4	5	6	7	8	9
The maintenance of SiO_2 in the ready burnt product, %	6.6	5.4	5.2	3.7	6.3	5.1	4.9	3.0
(CaO/SiO_2) of a finished product, unit.	1.35	1.45	1.55	1.25	1.25	1.35	1.45	1.55
Corner of a natural slope of a finished product, hail.	36	38	41	39	39	38	40	39,5
The maintenance of classes in a finished product, %: 60-100 mm	0	0	0	0	0	0	0	0
20-60 mm	72.4	78.6	80.2	85.3	75.1	78.6	80.2	81.4
5-20 mm	24.4	19.6	16.3	12.6	21.5	19.6	17.3	16.3
0-5 mm	3.2	2.8	2.5	2.1	3.4	2.8	2.5	2.3
Durability in a drum of a finished product (DSTU ISO 3271:2005), %: on blow (+5 mm)	96.7	94.2	93.1	92.7	93.1	93.2	92.9	92.7
abrasion (-0,5 mm)	2.9	3.4	3.6	3.8	3.3	3.4	3.7	4.2
Durability at restoration (DSTU ISO 7215:2008), %: durability (+5 mm)	73.1	79.5	87.6	92.8	71.2	79.5	87.6	94.6
abrasion (-0,5 mm)	4.3	4.1	3.7	3.6	4.5	4.1	3.7	3.2
Gas permeability and layer shrinkage at restoration (ДСТУ 3205-95): shrinkage of a layer, %	26	19	17	14	19	16	17	13
pressure difference of gas, Pa	73	64	68	58	72	69	68	65
Extent of restoration (DSTU ISO 7215:2008), %	93.4	91.6	87.2	90.1	92.4	91.6	88.2	90.1

** – l.m.p., h.m.p. – respectively, pellets with low and high temperature of melting.*

Reduced size of green pellets with a low melting point to 8-14 mm accelerated their heating and melting, and the increase in size of green pellets with a high melting point to 14-20 mm slowed their heating and melting caused them with a minimum amount of refractory compounds to melt the pellets with low melting point. After high temperature firing and cooling pellets with high melting points were framed and melted pellets with a low melting point is the relationship of this framework in the agglomerated material. The size of the pieces and their uniformity depended on the mixing ratio of low and high pellets and the uniform distribution of pellets between the low-temperature high-temperature pellets. The results of the second series of tests are shown in tab. 2.

Comparative characteristics of conventional metallurgical agglomerated iron-containing materials (sinter and pellets) and developed, called fluxed pellets from local speck show (table 3) that the material in virtually all indicators meet the requirements of the blast furnace.

Table 3

Metallurgical characteristics of agglomerated iron ore materials

Name indicators	**Industrial fluxed sinter**	**Industrial and non-fluxed pellets fluxed**	**Designed (fluxed local specs of pellets)**
Maintenance of Fe_{main}, %	51.2-57.6	62.2-65.8	63.1-64.7
Maintenance of FeO, %	9.1-15.6	1.3-2.7	2.1-3.8
Maintenance of SiO_2, %	10.4-9.2	7.7-4.7	6.9-2.7
Basicity (CaO/SiO_2) finished product, unit.	1.2-1.8	0.1-1.25	1.25-1.5
Maintenance of classes, %: 60-100 mm	23.7-35.6	0	0
20-60 mm	55.9-34.3	0	81.4-75.1
5-20 mm	12.3-7.8	93.5-97.3	16.3-21.5
0-5 mm	8.1-20.4	4.5-2.7	2.3-3.4
Durability in a drum, DSTU ISO 3271:2005, %: on blow (+5 mm)	84.5-57.4	92.4-97.1	92.7-93.2
abrasion (-0,5 mm)	8.3-10.2	5.8-1.5	4.2-3.4
Durability at restoration, DSTU ISO 7215:2008, %: durability (+5 mm)	37,8-49,4	69,3-95,8	71,2-91,6
abrasion (-0,5 mm)	10,4-9,8	4,7-2,1	4,5-3,2
Gas permeability and layer shrinkage at restoration, DSTU 3205-95: shrinkage of a layer, %	15-18	23-67	13-19
pressure difference of gas, Pa	68-71	108-154	65-72
Degree of restoration, DSTU ISO 7215:2008, %	65,1-82,3	72,8-91,4	88,2-92,4
Corner of a natural slope, hail.	38-41	28-32	36-41

Test results show that when using the iron ore concentrates varying degrees of enrichment may get agglomerated iron-containing material – local specs of fluxed pellets having the best metallurgical characteristics of sinter and pellets and satisfying modern requirements of blast furnace.

3. Development of technology for the production of iron ore specs with high iron content

Considering incomplete compliance of adaptability to manufacture of implementation of parameters of production of earlier developed new types of agglomerates iron ore raw materials and requirements of domain melting to a complex of its metallurgical characteristics, technologies of receiving homogeneous for chemical and granulometric composition of agglomerates completely fluxed iron ore material with the metallurgical characteristics meeting all modern requirements of domain melting[15] are offered. However, the content of iron in these types of an agglomerates material was higher, than in agglomerate and at the same level, as in pellets.

Authors developed and patented the technological parameters, allowing to receive the agglomerates completely fluxed ferriferous material possessing the majority of positive characteristics of agglomerates and pellets, and also having the minimum quantity of their negative characteristics. This material contains increased amount of iron at the minimum contents silica that will be useful for domain melting, especially in case of manufacturing of crude pellets for this material with low temperature of melting from the highly siliceous concentrates containing more than 5 % for SiO_2. Thus other metallurgical characteristics do not worsen[16].

Charge for receiving an agglomerates fluxed material consisted of two parts with high and low temperatures of melting. The first part of charge consisted of the metallized pellets or the metallized lumpy ore with extent of metallization of 5-95 % and a fineness of 10-20 mm, at their mass quantity in a mix with the second part charge (low-temperature crude pellets) equal 60-85 %. The temperature of melting of this part charge in makes more than 1500°C. Use of the metallized ferriferous materials allows to raise the content of iron in an fluxed agglomerates material without dependence on the content of iron in initial ferriferous (a concentrate, ore) a material, and extent of their metallization is defined by economic feasibility of process of production. The second part charge for receiving crude fluxed pellets with low temperature of melting consisted from finely divided iron ore a concentrate, the gumboil, a binding additive and firm fuel. Basicity (CaO/SiO_2) in this part charge was supported by more than 2.1 of a unit, fluxed its limestone to such size to provide basicity of all received agglomerates material of 1.1-1.5 the piece necessary for domain melting. From this charge received crude pellets, and the fineness of these crude pellets with low temperature of melting was 8-14 mm, and their mass

[15] Lyalyuk V.P., Tarakanov A.K., Zhuravlev F.M., Kassim D.A., Chuprinov E.V. Improvement in Blast-Furnace Performance by Using a New Form of Iron Ore. *Steel in Translation*. 2018. №1. P. 39–44.

[16] Спосіб виробництва офлюсованого огрудкованого матеріалу з підвищеним вмістом заліза: пат. 85795 Україна; МПК C22B 1/14 (2006.01). № 201308555; заявл. 08.07.2013; опубл. 25.11.2013, Бюл. № 22. 8 с.

quantity in a mix with metallized pellets made 40-15 %. The temperature of melting of this part charge in the oxidizing or non-oxidizing atmosphere makes 1140-1180°C. In the course of transportation the high-temperature (metallized) and low-temperature (crude) pellets mixed up and loaded into an roasting bowl and were exposed to heat treatment. Mode of heat treatment and formation of a homogeneous fluxed agglomerates material in, heating, roasting and cooling oxidizing or non-oxidizing (containing less than 0.2 % of oxygen) the gaseous heat-carrier with the following temperature in zones: drying – 350-450°C, heating – 600-1200°C, roasting – 1200-1300°C and coolings – 25-30°C. 50-100°C cooled to temperature the fluxed agglomerates material was exposed to the analysis with definition of its metallurgical characteristics (table 4).

Table 4

Metallurgical characteristics of agglomerates iron ore materials for domain melting

Name indicators	**Industrial fluxed agglomerate**	**Industrial nonefluxed and fluxed pellets**	**Developed fluxed local bake**	
			I. Fluxede local bake from different concentrates	**II. Flyxed local bake with the raised content of iron**
Maintenance of Fe_{gen}, %	51.2-57.6	62.2-65.8	62.9-64.7	64.3-74.2
Maintenance of FeO, %	9.1-15.6	1.3-2.7	2.1-4.1	3.8-5.7
Maintenance of SiO_2, %	10.4-9.2	7.7-4.7	6.3-3.7	6.3-2.8
Basicity (CaO/SiO_2) finished product, unit.	1.2-1.8	0.1-1.25	1.25-1.55	1.21-1.45
Maintenance of classes, %: 60-100 mm	23.7-35.6	0	0	0
20-60 mm	55.9-34.3	0	81.4-72.4	80.4-76.2
5-20 mm	12.3-7.8	93.5-97.3	12.6-24.4	16.3-21.5
0-5 mm	8.1-20.4	4.5-2.7	2.1-3.4	1.8-3.3
Durability in a drum, DSTU ISO 3271:2005, %: on blow (+5 mm)	57.4-84.5	92.4-97.1	92.7-96.7	91.3-93.2
abrasion (-0,5 mm)	10.2-8.3	5.8-1.5	4.2-2.9	4.2-2.5
Durability at restoration, DSTU ISO 7215:2008, %: durability (+5 mm)	37.8-49.4	69.3-95.8	71.2-94.6	79.5-94.6
abrasion (-0,5 mm)	10.4-9.8	4.7-2.1	4.5-3.2	4.9-3.0
Gas permeability and layer shrinkage at restoration, DSTU 3205-95: Shrinkage of a layer, %	15-18	23-67	13-26	16-21
pressure difference of gas, Pa	68-71	108-154	58-73	62-73
Degree of restoration, DSTU ISO 7215:2008, %	65.1-82.3	82.8-91.4	87.2-93.1	90.1-93.3
Corner of a natural slope, hail.	36-41	28-32	35-41	38-41

Results of tests showed (table) that in the received fluxed agglomerates material the content of iron is essential above, than in industrial (agglomerate and pellets) and earlier developed fluxed local specs. Thus basicity of all agglomerates materials is almost identical. The granulometric structure is more homogeneous than at agglomerate, and the maintenance of a trifle (0-5 mm) is lower. Thus strength characteristics of an initial material it is better than at agglomerate (durability on blow of 91,3-93,2 % against 57,4-84,5 %; an abrasion of 4,2-2,5 % against 10,2-8,3 %) also are almost similar to pellets. The corner of a natural slope is similar to agglomerate and coke and above what at pellets. Properties at restoration the following: durability at restoration is similar to pellets and above what at agglomerate, gas permeability and a layer shrink at restoration is similar to agglomerate and it is better than at pellets, and extents of restoration are higher than at both materials.

CONCLUSIONS

Test results show that when using the iron ore concentrates varying degrees of enrichment may get agglomerated iron-containing material – local specs of fluxed pellets having the best metallurgical characteristics of sinter and pellets and satisfying modern requirements of blast furnace.

The developed agglomerates ferriferous material – fluxed local specs from a mix of the metallized pellets and crude pellets with rather low temperature of melting, possesses the best metallurgical characteristics of agglomerate and pellets and has thus higher content of iron meeting modern requirements of domain melting.

SUMMARY

Developed and tested charges composition to produce two kinds of raw green pellets defined particle size and quantity of each type of green pellets in the mixture, the maximum heat treatment temperature mixture, specific performance kiln conveyor machines and comparative metallurgical characteristics agglomerated iron materials for blast furnace.

Structures of charge for receiving two types initial (metallized are developed and tested and low-temperature crude) pellets, the fineness and quantity of each type of pellets in mixes, the maximum temperatures of heat treatment of a mix and comparative metallurgical characteristics traditional (agglomerate and pellets) and the developed fluxed agglomerates ferriferous material for domain melting with the raised content of iron are defined.

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