

A HANDBOOK OF FUSION

FERRO ALLOYS

(METHOD WITH THE PHOENIX FUSION MACHINE and Protective wall)

Weight ca 0.200 g of very finely ground ferro-alloy sample (100 μ maximum) and mix it carefully with 4 g of OXYDANT MIX. Put to one side.

Weight 5.000 g of LT100 and place it in the crucible.

In order to create a wall of flux with the Phoenix machine proceed as such:

First push on the "Hold Swirling button" set Premelt to 10 sec, Melting to 120 sec at 1350°C.

Start the machine. When the flux is totally melted stop the heating process by switching off the Burner Select Buttons for each burner and continue the swirling without flames until we obtain a wall of flux around the inside of the crucible.

Cool down and add the mix in the protected crucible.

Then start the program for ferro-alloy:

Premelt 7-10 min at 800°C, Melting 3 min at 1350 °C, Swirling 4 min.

Cooling rate must be set depending on the sample.

CAUTION: it is necessary to test the method beforehand in order to check that there will be no damage to the platinum labware.

Ferro-silicium, ferro-manganese, silicium manganese

Weigh 200 mg of finely ground ferro-alloy mix with 2000 mg potassium carbonate and 1000 mg potassium iodate (KIO₃). Proceed as described previously. (5000 mg LT100)

Premelt-pre-oxidation: Heat at 800 °C for 10 min. We observe a black viscous mobile liquid

Then fuse as described previously.

2.13.3 DIRECT METHOD WITH PHOENIX FUSION MACHINE

2.13.3.1. Silicium carbide

Prepare a mix of 200 mg sample with 650 mg V₂O₅, 1.200 mg AT100, 1.200 mg Sr(NO₃)₂ and 3.600 gm Li₂CO₃. Add 2 drops of LiBr solution at 250 mg/litre

In the bottom of a tall shape crucible add 4.000 gm of LT100.

Pre-oxidation step: 12 minutes, temperature of flames 900 °C

Melting without swirling: 4 minutes, temperature of flames 1400 °C

Melting with swirling: 2 minutes.

Cooling: 5 minutes.

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2.13.3.2. Ferro-Silicon

Prepare a mix of:

200 mg sample. 500 mg V_2O_5 . 1.000 mg AT100. 500mg Lithium nitrate.

200 mg $Sr(NO_3)_2$ 200 mg of potassium nitrate and 1.600 gm Li_2CO_3 .

In the bottom of a high shape crucible add 4.000 g of LT100.

Phoenix fusion Machine: Pre-oxidation step: 12 minutes, temperature of flames 900 °C.

Melting without swirling: 4 minutes, temperature of flames 1400 °C.

Melting with swirling: 2 minutes.

Cooling: 5 minutes

2.13 Steel industry

2.14.1. Slag, agglomerate, dust furnace, hematite, Iron ore 40 up to 90 % Fe.

Ratio: Fluomix PB680 = 8.500 g. Sample = 500 mg.

Phoenix fusion Machine: Premelt 180 sec at 900°C. Melting 240 sec at 1400°C (temperature of the flames). Melting with swirling 300 sec. Forced cooling 300 sec.

2.14.2. Slag (30% Fe, 50% CaO, 10 % SiO_2), Dust (50 % Fe, 30% Zn)

Place 6.000 mg of AT100 in the bottom of the crucible add on top a mix of 250 mg of Sample with 1.250 mg Lithium nitrate and 2.000 g of LT100. On top of this add a lid of 1.000 g LT100.

Phoenix Fusion Machine: Premelt 420 sec at 900°C. Melt 240 sec. at 1375°C (temperature of the flames). Melt with swirling 240 sec.

Forced cooling: 320 sec for the slag.

No forced cooling for the furnace dust.

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4. General methods used in the steel industry

XRF	BEADS	General	Gas dust	Slags	Fe-Cr- C (1)	Fe-Si (2)
Sample	Quantity Granule.	0,300 g < 80 μ	0,250 g < 80 μ	0,500 g < 100μ	0,250 g <200 μ	0,250 g <200 μ
Flux	Type Origin Quantity	LT66:MT34 XRFS 5,000 g	LT100 XRFS 5,000 g	LT100 XRFS 5,500 g	LT100 XRFS 5,500 g	LT100 XRFS 5,000
Additives	Halides	Lil: 0,020 g		Lil: 0,02		Lil: 0,040
Oxidant	LiNO ₃	0,200 g			0,750 g*	0,750 g*
	NaNO ₃				* or	* or
	KNO ₃		0,500 g		0,125 g	0,125 g
	Sr(NO ₃) ₂			0,500 g	0,250 g	0,250 g
	Li ₂ CO ₃				2,000 g	
	Na ₂ CO ₃ NaIO ₄				0,020 g	
Pre-Oxyd.	Temp.	900 950°C	- 900 °C	900 °C	1200°C	900°C
	Duration	5-6 min.	5-6 min.	5-6 min.	6 min.	6 min.
Fusion	Temp.	1.250 °C	1250 °C	1100 °C	1200 °C	1200 °C
	Duration	4 min.	4 min	3,25 mi.	3 min	3,5min
Crucible Dishes	Quality	Pt/Au 95:5	Pt/Au 95:5	Pt/Au 95:5	Pt/Au 95:5	Pt/Au 95:5
	Quality	Pt/Au 95:5	Pt/Au 95:5	Pt/Au 95:5	Pt/Au 95:5	Pt/Au 95:5

Pre-oxidation: best results are obtained in a Pt/Au crucible in a muffle furnace at Temp from 400°C to 800 °C.

(1) Method applicable for Carburated Ferro-alloys

(2) Method applicable for alloys: Fe-B, Fe-Ti-Al, Fe-Cr, Fe-Mn, Fe-Si, Fe-Si-Mn, and Fe-Nb.