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Handbook of Extractive Metallurgy, Volume 2

Fathi Habashi

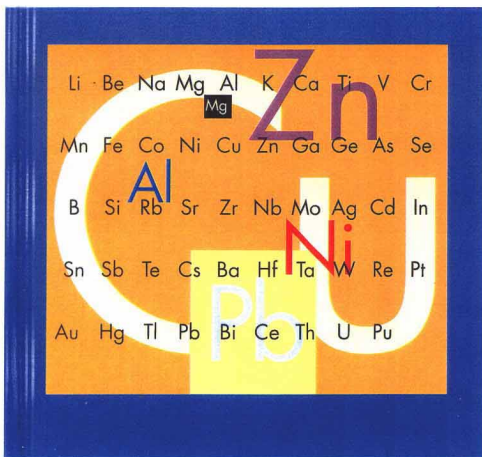


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Handbook of Extractive Metallurgy

Edited by Fathi Habashi

Volume II





Handbook of Extractive Metallurgy

TABLE 2-40. Iron ore production and fraction of world metal exported by country

Country	Production, 10 ⁶ t		Exports, 10 ⁶ t		% of World Demand
	1995	1997	1995	1997	
Australia	38	125	31.3	107	73
Brazil	38	46	0.3	0.3	0
Canada	64	61	0.3	0.3	0
China	49	265	3.3	9.1	0
India	30	46	0.4	1.9	0.1
Indonesia	59	3.5	20.4	2.1	0.4
Japan	30	0.7	2.8	0.4	0.1
Korea	64	3.1	3.1	2.6	0.4
Malaysia	64	396	2.9	2.8	0.4
Mexico	64	37.3	37.6	37.6	0.4
Peru	64	142.3	37.8	37.2	0.1
South Africa	60	16.7	146.0	95.2	3.9
Tanzania	60	8.0	37.2	145.0	3.1
U.S.	60	5.3	7.0	18.2	3.1
U.S.S.R.	60	5.3	3.4	8.3	3.1
Vietnam	60	0.6	0.2	0.3	0
Yemen	60	0.4	0.2	0.3	0
Zimbabwe	60	24.4	22.0	5.6	0.1
Zimbabwe	60	17.6	39.6	0.7	0.1
Spain	44	7.2	13.8	22.7	0.1
Iran	35	3.4	30.0	12.6	0.1
Iran	35	2.0	3.4	3.7	0.1
South Korea	43	0.3	2.0	3.8	0.1
Other Asia	43	0.2	0.5	0.3	0.1
Argentina	48	0.9	0.9	0.1	0
New Zealand	48	49.8	0.9	0.2	0
Other Austral. Island	48	0.5	0.4	0.0	0
China	48	0.1	0.3	0.1	0
North Korea	48	0.1	0.1	0.1	0
Vietnam	48	0.1	0.1	0.1	0
Yugoslavia	48	0.1	0.1	0.1	0
Russia	60	97.3	0.3	0.3	0.1
Belgium	48	0.2	0.2	0.1	0.1
France	48	236.0	0.3	0.1	0.1
Germany	48	142.5	251.6	26.3	0.1
Italy	48	5.9	157.0	250.4	0.1
Former Czechoslovakia	48	6.8	8.0	153.8	0.1
Austria	48	2.9	4.2	8.0	0.1
Sweden	48	6.4	8.0	14.9	0.1
Other Europe	48	2.1	1.9	2.0	0.1
U.S.S.S.R.	48	1.8	1.8	2.1	0.1
U.S.S.S.R. - metals	48	0.8	0.8	0.7	0.1
U.S.S.S.R. - non-metals	48	10.7	10.5	14.2	0.1
World total	48	438.7	426.7	552.1	0.2
		100	100	100	100

* Preliminary figures in some cases available.

FROM THE CONTENTS:

● VOLUME I

The Metal Industry:

- The Economic Classification of Metals
- Metal Production
- Recycling of Metals
- By-Product Metals

Ferrous Metals:

- Iron
- Steel
- Ferroalloys

● VOLUME II

Primary Metals:

- Copper
- Lead
- Zinc
- Tin
- Nickel

Secondary Metals:

- Arsenic
- Antimony
- Bismuth
- Cadmium
- Mercury
- Cobalt

Light Metals:

- Beryllium
- Magnesium
- Aluminum
- Titanium

● VOLUME III

Precious Metals:

- Gold
- Silver
- Platinum Group Metals

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- Niobium
- Tantalum
- Zirconium
- Hafnium
- Vanadium
- Rhenium

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- Germanium
- Gallium
- Indium
- Thallium
- Selenium
- Tellurium

Radioactive Metals:

- General
- Uranium
- Thorium
- Plutonium

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- General
- Cerium

● VOLUME IV

Ferroalloy Metals:

- Chromium
- Manganese
- Silicon
- Boron

Alkali Metals:

- Lithium
- Sodium
- Potassium
- Rubidium
- Cesium
- Alkali Sulfur Compounds

Alkaline Earth Metals:

- Calcium
- Strontium
- Barium

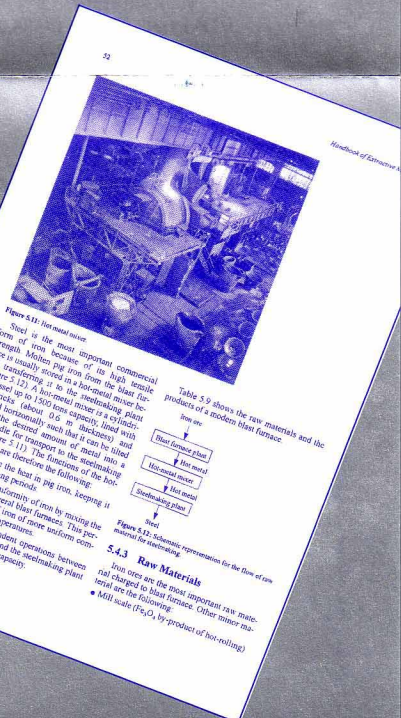
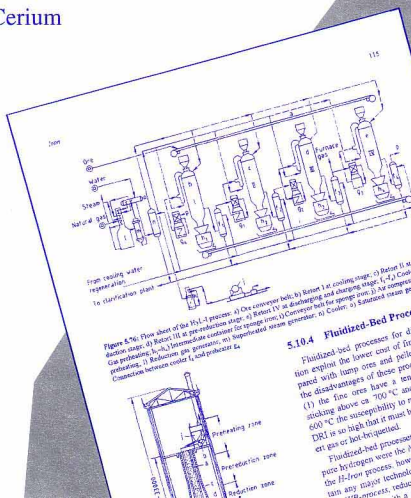


Figure 5-11: Hot metal mixer

Steel is the most important commercial product of iron because of its high tensile strength. It is usually derived from the blast furnace gas (Figure 5-12). A hot metal mixer is a cylindrical vessel (about 0.6 m diameter) with horizontal lugs for transport to the steelmaking plant (Figure 5-13). The functions of the hot metal mixer are:

- To conserve the heat in pig iron, keeping it from becoming too hot for the steelmaking process.
- To promote austempering of iron by keeping it in the blast furnace for a period of time, promoting the delivery of iron to the steelmaking process.

Figure 5-12: Schematic representation for the blast furnace

Table 5-9 shows the raw materials and the products of a modern blast furnace:

5.4.3 Raw Materials

Iron ores are the most important raw materials used to blast furnace. Other important materials are the following:

- Mill scale (Fe₃O₄, by-product of hot-rolling)

5.10.4 Fluidized-Bed Processes

Fluidized-bed processes for direct reduction require the lower cost of fine iron ore compared with lump iron and pellets. However, the disadvantages of these processes are: (1) the fine ore has a tendency to stick to the walls of the reactor at temperatures above 600°C, the susceptibility to reduction is lower than that of lump iron, and (2) the gas containing 85% H₂ is so high that it must be stored under pressure or last-activated.

Fluidized-bed processes that operated with pure hydrogen were the flow/roll process and the H₂-flow process. However, they did not attain any major technological significance. In the H₂-flow process, reduction was carried out in a gas containing 85% H₂ and 15% N₂.