

MEDSTERN CANADA LLP



RELIABLE. AUTHENTIC.

EDITION
SUMMER 2025



STEELMAKING

The transformation of iron into carbon steel starts with iron ore, which is smelted, then refined to reduce the carbon and introduce other alloying elements, resulting in steel.

RELIABLE IRON

For Resilient Infrastructure

BRIDGES, PORTS, TUNNELS & TERMINALS

Iron (Fe), especially in the form of steel, is a cornerstone of modern industry due to its unique combination of properties. It's strong, stiff, abundant, and relatively cheap for a metal, making it ideal for large-scale construction, infrastructure, and manufacturing.

RENEWABLES

Clean Tech, Energy Storage



Austenitic stainless steels like 304 and 316 are commonly used in water tanks, and piping. Additionally, stainless steel is increasingly important in energy storage and conversion systems, including fuel cells, electrolyzers and flow batteries. Cryogenic steel is a key material used in the construction of e.g., LNG storage tanks.

AUTOMOTIVE

Car Manufacturing, Motorsport



High-Strength Low-Alloy Steels (HSLA) are crucial in modern car manufacturing for enhancing safety, fuel efficiency, and for allowing lighter, stronger vehicle structures. Advanced High-Strength Steel (AHSS) represents further improvements in strength, ductility and hardenability as well as enhanced formability.

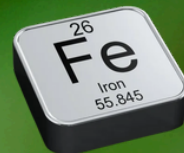
INVESTMENT OPPORTUNITIES

Sustainable Mining, Metals, and Galvanic Industries

Canada boasts a diverse range of minerals, including traditional commodities like base metals, as well as critical minerals. The country is home to a large number of mining companies and is a leading destination for international mining finance. Foreign direct investment (FDI) in the Canadian mining sector was \$65.1 billion in 2022.

Status 2024/2025

ACCESS RESOURCES, GROW SUPPLY BASE



MINES, MINERAL DEPOSITS

METAL, GALVANIC INDUSTRIES

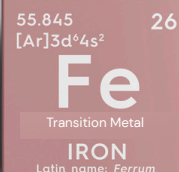
LOGISTIC INFRASTRUCTURE

Including extraction, services, primary and downstream manufacturing, the Canadian Mining and Metals Sector contributed a total of \$108.5 billion to GDP in 2022. Canada has a well-established mining sector with a supportive regulatory framework, including established stock exchanges. Investors who can guarantee offtake agreements contribute significantly to the economy.

Reliable and robust technologies are the key to leaving behind only clean water, healthy landscapes, and achieving greater competitive strength through value-added mining and metal commodities.

AUTHENTIC IRON

Physical and Chemical Properties



Atomic Structure, Iron, Fe

Electron Affinity	15.7 kJ/mol	Electronegativity (Pauling)	1.83
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Periodic Table of the Elements

Iron, Fe

Period 8

Group 4

Physical Properties, Iron, Fe

Density at 20 °C	7874 kg/ m ³
Spec. Heat Capacity	449 J/ (kg * K)
Melting point	1811 K, 1538 °C
Boiling point	3134 K, 2861 °C

Isotopes, Iron, Fe

⁵⁴ Fe	⁵⁶ Fe	⁵⁷ Fe	⁵⁸ Fe
53.9396 u	55.9349 u	56.9354 u	57.9333 u

PHYSICAL



Appearance: silvery-grey metal

Crystal Structure: Body-centered cubic

Hardness: 4.0 Mohs Scale, depending on purity

Malleability: inherently malleable and ductile

Conductivity: good conductor of heat, electricity

Young's Modulus: 211 GPa

CHEMICAL



Corrosion Resistance: is susceptible to corrosion due to its reactivity with oxygen and water.

Thermal Expansion (25°C): 11.8 µm (m⁻¹ · K⁻¹)

Common Oxidation States: +2, +3, also +4, +5, +6

Iron Compounds: e.g., Ferrosoferric Oxide (Fe₃O₄), Ferric oxide (Fe₂O₃), Ferrous oxide (FeO)

IRON MINERALS

Mining Industry, Raw Materials

Siderite

(FeCO_3)



Carbonate minerals
Strunz:
5.AB.05

Hematite

(Fe_2O_3)



Oxide minerals
Strunz:
4.CB.05

Magnetite

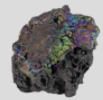
(Fe_3O_4)



Oxide minerals
Strunz:
4.BB.05

Goethite

($\alpha\text{-Fe}^{3+}\text{O(OH)}$)



Oxide minerals
Strunz:
4.FD.10

FROTH FLOTATION

Magnetite Ore Preparation Phase: From Gangue Material to dried Magnetite Concentrate Fe_3O_4

Crushing

Grinding

Classification

Beneficiation

- ☐ Jaw-, cone-, hammer crushers
- ☐ Ball mills, rod mills, stirred mills
- ☐ Hydrocyclones, magnetic separation
- ☐ Froth flotation, for fine-grained gangue minerals
- ☐ Magnetite head grade 20- 30% Fe Grade
- ☐ smaller-sized rocks, finer particles
- ☐ particle size 80% < 200 mesh
- ☐ Dewatering of iron concentrate slurry, filtration

Flotation Process

- ☐ Slurry Preparation
- ☐ Making hydrophobic Magnetite Particles
- ☐ Mechanical agitation, air injection
- ☐ Foam layer skimming, dewatering, tailings
- ☐ Addition of water
- ☐ Addition collectors, frothers, e.g. fatty acids, anionic and cationic surfactants
- ☐ Reverse Flotation
- ☐ e.g. Magnetite Concentrate: 70- 80% Fe grade

IRON PROCESSING

The Metal and Galvanic Industries

From Fe_3O_4 to molten Fe, 'hot metal'

Pelletizing

☐ Slurry preparation

☐ Heating coke $> 1250^\circ\text{C}$

☐ Blast furnace, byproduct CO_2

☐ Rotating drums

☐ Iron ore pellets, $> 80\% \text{Fe}_3\text{O}_4$

☐ $\text{Fe}_3\text{O}_4 + 4\text{CO} \rightarrow 3\text{Fe} + 4\text{CO}_2$

Reduction

ELECTRIC ARC FURNACE

From 'hot metal' to semi-finished, finished steel products

Refining

☐ 'Hot metal' ☐ Temp.: $1700^\circ\text{C} - 3500^\circ\text{C}$ ☐ Semi-finished steel

☐ Si, Mn, P, C adjustments in steel % content, impurity removal

Finishing

☐ Forging, casting, welding, rolling, machining

☐ Finished, e.g. steel beams

TRANSPORTATION SUPPORT SERVICES

Supply Chain Integration



Tailored logistics support services are available to B2B Partners, outsourcing their supply chain needs, including secure storage in warehouses, freight rail transportation, and specialized service providers for cargo handling and management, to ensure products get to market on time and within budget.

MODES OF TRANSPORTATION

- Trucks: for short distance hauls and last-mile delivery
- Trains: for long-distance transport of products, goods
- Ships: for large volumes of commodities via ocean freight

TRANSLOADING FACILITIES

- Access to distribution centers, warehouses, and storage space
- Secure transfer of commodities between modes of transportation, e.g., rail-to-ship

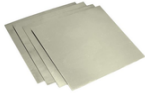
LOGISTICS SUPPORT

- Optimized shipping processes, analysis, including route planning, cost calculation, carrier identification, shipment tracking, and tracing for precision, real-time product movement

IRON PRODUCT FORMATS

Industrial Formats for Iron, Fe and Steelmaking

Tailored product formats can be made accessible to B2B Partners, based on achieved off-take agreements. The highlighted products on this page are a selection of possible product alternatives available for trade.

Ferro Nickel Billets, Ni-Fe	Ferro Molybdenum Billets, Mo-Fe	Ferro Titanium Billets, Ti-Fe	Ferro Niobium Billets, Nb-Fe
			
Ingots	Sheets	Rods	Hot rolled shapes
			
Tubes, Pipes	Wires	Ferro Copper, Powder, Fe-Cu	Coils
			

IRON AND STEEL COMMODITIES

Classes and Standards

Examples of Common Carbon Steel Alloys

☐ Low Carbon Steel

- ☐ ASTM A36, A516
- ☐ DIN EN 10025, 10130
- ☐ DIN 17100, ST37, ST52
- ☐ Carbon < 0.30%

☐ Medium Carbon Steel

- ☐ AISI 1045
- ☐ DIN EN 10025 S235, S355
- ☐ DIN 17200, C45, C50, C55
- ☐ 0.30% ≥ Carbon ≤ 0.60%

☐ High Carbon Steel

- ☐ ASTM A295, Grade 900 Rail
- ☐ DIN EN 10083-2, C70
- ☐ DIN 17200, C65
- ☐ Carbon > 0.60%

Hot-Rolled Steel

☐ Hot-rolled, low carbon steel shapes

- ☐ DIN EN 10051, 10073, 10111, 10163-2
- ☐ Steel rods, plates, and strips for pressure vessels, piping

The Ferroalloys, Master Alloys

☐ 'Ferronickel', Ni-Fe alloys, Billets, Ingots

- ☐ DIN EN ISO 6501:2021, e.g. NiFe60

☐ 'Ferrotitanium', Ti-Fe alloys, Billets, Ingots

- ☐ DIN 17566:2004-02, e.g. FeTi70

☐ 'Ferromolybdenum', Mo-Fe alloys, Billets

- ☐ DIN 17561-2004-02, e.g. MoFe65

☐ 'Ferro niobium', Nb-Fe alloys, Billets, Ingots

- ☐ DIN 17569:2004-02, e.g. NbFe70

Metallic Powders

☐ High-Purity Metallic Powders, e.g. FeCu30

- ☐ DIN 30910-4:2004-05
- ☐ ISO/ASTM 52907:2019
- ☐ 3D Printing/Additive Manufacturing

HSLA and AHSS

☐ High-Strength Steels

- ☐ DIN EN 10149-2 S335J2
- ☐ ASTM A588 Grade C, SAE 950X
- ☐ E.g. Infrastructure, Bridges

☐ Advanced High Strength Steels

- ☐ DIN EN 10149-2 S355MC
- ☐ C300MS, Complex Phase (CP)
- ☐ E.g. Automotive, Motorsport

Measurement Standards

☐ Measurement Standards

- ☐ ISO 4552-2, ISO 3713, Ferroalloys
- ☐ DIN 1710, Carbon Steel Plate
- ☐ DIN EN 10029, Dimensions, Shape
- ☐ EN ISO 6507-1, Vickers Hardness

☐ Calibration, Delivery, Environmental

- ☐ DIN 17034, ISO 17025, Laboratories
- ☐ ISO 8954-1:1990, Technical Requirements, Ferroalloys
- ☐ EN 1090-2, ISO 9001, Structural Steel, Robust Quality
- ☐ DIN EN ISO 14001, Environmental, Water Resources

GLOSSARY

Abbreviations, Definitions

Froth Flotation	a mineral processing technique that separates valuable materials from tails based on differences in their surface properties, specifically their hydrophobicity (water-repelling) or hydrophilicity (water-attracting).
Electric Arc Furnace	a furnace that uses an electric arc to heat and melt metals, by passing an electric current through them. Key components are a furnace chamber, electrodes (e.g. graphite), a power source, and a system for charging and discharging the furnace.
Electrowinning	an electrolytic process used to recover metals from a solution by depositing them onto a cathode using an electric current. Base metals like zinc, nickel, copper, and cobalt can be recovered through electrowinning.
Standardization Institutes	ISO: International Organization for Standardization EN: European Norm/ Standard ASTA: American Society for Testing Materials DIN: Deutsches Institut für Normung

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Catalogue and B2B Centre

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*Let us solve your B2B
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- Business Consulting
- Buyer and vendor Identification
- Go-to Market Services
- Technical Liaison
- Supply Chain Support
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