

# **Carbon and Graphite**

# **Raw Materials**

# **Types of Graphite**

There are two forms of graphite used in the world today, synthetic and natural. Graphite (natural and synthetic) can be processed: die–molded, extruded, isostatic pressed, expanded, reinforced and coated. It can be transformed into yarns, foils and sheets, tapes, boards, rigid and soft felts, powders



### **Natural Graphite**

	Flake	Vein	Amorphous
Description	Crystalline graphite flakes; coarse >150 µm; fine <150 µm	Interlocking aggregates of coarse graphite crystals; typically >4 cm	Microcrystalline, soft earthy graphite; mostly <40 μm
Origin	Syngenetic; regional metamorphism of organic matter in metasedimentary rocks	Epigenetic; regional metamorphism involving CO2–CH4–H2O fluids	Syngenetic; contact and/or regional thermal metamorhism of coal seams
Ore	2–30% graphite; stratabound, tabular or lenses	>90% graphite; veins and fracture infill	>70% graphite; in anthracitic coal layers, typically folded and faulted
Product Grade (graphite concentrate level)	85%-99% graphitic carbon (Cg)	90-99% Cg	75-90% Cg
Main Uses	Refractories, batteries, brake linings, flame retardants	Carbon brushes, brake linings, batteries, lubricants	Steel recarburiser, foundry mould facing, lubricants, pencils
Major Producers	China, Mozambique, Madagascar	Sri Lanka	China, Mexico, North Korea, Turkey

## **Types of Natural Graphite**

### **Material properties**



excellent conductor of heat and electricity



stable over a broad range of temperatures

# EU consumption (2020) 86 Kt

Refractories for steelmaking	54%
Refractories for foundries	15%
Graphite shapes	7%
Lubricants	6%
Batteries	6%
Pencils	4%
Recarburising	4%
Friction products	4%



lubricant



highly refractory material with a sublimation temperature of 3650 °C

# EU production of graphite will deliver against the EU Critical Raw Material Action Plan:

- reduce Europe's dependency on third countries
- diversifying supply from both primary and
- secondary sources
- improving resource efficiency and circularity
- promoting responsible sourcing
- enabling transition towards a green and digital economy
- bolster Europe's resilience and open strategic autonomy in key technologies needed for such transition
- secure and sustainable supply of raw material

source: JRC, Critical Raw Materials Assessment





source: Battery Materials Review



### Synthetic Graphite

Synthetic graphite is a manufactured product made by high-temperature treatment of non-graphitic carbon. The primary raw materials used to produce Synthetic Graphite are calcined cokes and coal tar pitch.



## Different types of coke

#### **Examples:**

Petroleum needle coke is a highly graphitizable form of carbon.

• Demand (2021-2026)

Electrodes +9% Lithium ion batteries +22%

source: Mordor Intelligence

Producing region (2021)

Asia-Pacific	86%
Europe	10%
North America	4%

Rest of the world 1%

In addition, the industry can use Metallurgical coke as packing material for the furnace.

- **Top global producer** of met coke: China 49%
- Main EU sourcing of precursor coal : Australia 46%, USA, 31%, Russia 11%
- EU production only 3%

Anthracite is the coal with the highest carbon content and the least impurities and is used for other carbon products.

• EU imports (2021)

**Production of hard coal - EU (2021)** 



#### **European Carbon and Graphite Association**

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