

Graphite 石墨

The mineral **Graphite** is a form of carbon that has both metallic and non-metallic properties. It is an excellent conductor of both electricity and heat with the highest natural strength and stiffness of any material to extremely high temperatures (+3,500°C). Unlike most metal, when heated it does not expand.

It is best known as the “lead” in pencils and as a dry lubricant. It is a critical component in many leading edge alternative energy solutions in particular, as the anode in lithium-ion batteries where there is about 10 times more graphite than lithium – **a growing market** especially in new generation electric cars where there can be up to 40-80 kilograms in every electric car. Graphite is also commonly used in steelmaking to line blast furnaces, in electrical equipment as “brushes” in electrical motors.

There are 3 naturally occurring types of graphite:

- Crystalline flake graphite (flat, plate-like particles)
- Amorphous graphite
- Lump or vein graphite (coarse, flake graphite)

The name "graphite fiber" is also sometimes used to refer to carbon fiber or carbon fiber-reinforced polymer.

Graphite occurs in metamorphic rocks as a result of the reduction of sedimentary carbon compounds during metamorphism. It also occurs in igneous rocks and in meteorites. Minerals associated with graphite include quartz, calcite, and micas.

Graphite has a layered, planar structure. In each layer, known as graphene, the carbon atoms are arranged in a honeycomb lattice. The two known forms of graphite, alpha (hexagonal) and beta (rhombohedral), have very similar physical properties, except that the graphene layers stack slightly differently. The hexagonal graphite may be either flat or buckled. The alpha form can be converted to the beta form through mechanical treatment and the beta form reverts to the alpha form when it is heated above 1300 °C.



Lower Eyre Peninsula Graphite

Demand from batteries and high-tech applications including pebble-bed nuclear reactors is projected to be increasing – Lithium-ion batteries are projected to more than double the demand for graphite from 1.1 million tonnes per annum to about 2.6 million tonnes per annum by 2020.

That type of demand growth would require at least **20 new mines at 50,000 tpa**.

70% of world graphite is mined in China but resources (mostly amorphous) and exports from China are decreasing. China has imposed a 20% export duty on graphite plus a 17% VAT, and instituted an export licensing system to ensure supply to China's domestic economy. China has also recently closed down 20% of its mines (all in the Pingdu area) for environmental reasons.

Extensive graphite resources occur on Eyre Peninsula in South Australia. Within Australia, Eyre Peninsula is "**the Pilbara of Graphite**" and it now hosts five world class JORC mineral resources within the Global Top 20 Graphite Deposits outside of China. Lincoln's Kookaburra Gully deposit rates at the top of those Eyre Peninsula deposits and, taking into account the Kookaburra Gully Extended Exploration Targets, has the potential to not only be a Top 10 deposit in regard to grade but also in regard to contained graphite.

