Synthetic graphite may be purer but the future belongs to natural graphite

The price of natural graphite has more than doubled over the past few years and scientists have been developing new applications that have made it an essential mineral for the advancement of technology. In 2009, flake graphite traded at about USD$ 1,000 per ton; in 2011 it shot to about USD$ 3,000 per ton and now it has settled to about USD$ 1,800 per ton. Not surprisingly, the increase value of flake graphite has translated in a rush of new companies engaging in its extraction, many of them listed in Toronto and based in Quebec and eastern Ontario. The new graphite mining boom has been sustained as much by the ore’s value as by the potential for growing demand.

As is the case for rare earths, China has dominated natural graphite production even if ‘limited’ to 65 to 80% of world production as opposed to 90-95% in the former case. Just as rare earths, moreover, China adopted ‘protectionist’ policies on graphite exports, which helped boost prices in 2011. However, graphite’s demand and value have mostly been driven by the fact that it is an important component of a crucial energy storage device: the lithium-ion battery. Laptops, smart phones and electric cars such as the Tesla-S all derive their power from batteries which feature an anode made entirely with graphite. Most of this graphite is synthetic and natural flake, mined, graphite accounts for only 5% of global demand for batteries; nevertheless, when the natural graphite producers start to come into production they will help boost demand, to the point where natural graphite demand will match or exceed demand for synthetic graphite before the end of this decade.
Synthetic graphite is a material made from petroleum. Until recently, it has been used for specialty applications because of its superior consistency and purity (+99%) than natural graphite; manufacturers have therefore preferred it because it was able to offer higher reliability and performance, even if its price has been at least two or sometimes three times higher. It is possible to achieve higher purity from natural graphite of a lower initial grade by using one of two chemical purification treatments, which are hydrofluoric acid leaching and hydrochloric acid caustic leach. A high temperature thermal treatment also allows for purification of natural graphite. Synthetic graphite is very expensive to produce, deriving from petroleum coke and costing up to 10 times as much as the best natural graphite. But the game could turn in the next few years in favor of natural graphite because battery manufacturers are interested in increasing the proportion of natural graphite used in batteries to lower their production costs. Already emerging graphite miners Zenyatta Ventures (TSXV: ZEN) from its Albany deposit in central Ontario and Focus Graphite (TSXV: FMS | OTCQX: FCSMF) from its Lac Knife deposit in Quebec have achieved higher than 99% purity levels (Zenyatta actually achieved 99.96%), which makes them directly comparable to synthetic.

Natural graphite is also the basis of graphene, the uses of which seem limited only by scientists’ imaginations, given the host of new applications announced daily. Synthetic graphite is very limited when it comes to graphene. Indeed, the new wonder material has been considered so important as to have prompted the EU to contribute a billion Euros to private and public entities to fund graphene research, can only be made using natural graphite. The problem is to bring these technological developments on an industrial scale, but there’s no denying the future is in natural graphite. Natural graphite is much cheaper and environmentally responsible than synthetic. Synthetic graphite is derived from high temperature processes involving calcined petroleum coke and
coal tar pitch. Synthetic graphite will continue to dominate for the next few years in current applications requiring high purity, while available natural graphite production will be preferred for the manufacturing of refractories for the steel industry and lubricants, such as those used in the aerospace sector to facilitate movement of actuators and flaps.

The refractory industry is probably the largest consumer of natural graphite, become an essential additive due to its excellent thermal resistance and hydrophobic properties. Adding graphite to refractory products significantly increases the resistance to thermal shock and corrosion. The growing interest in graphite mining and the high purity levels that have been achieved will ultimately bring natural graphite into the orbit of high technology applications and graphene, a material whose time has come but whose development will need a few more years.