

Tesla and competitors to place pressure on global graphite demand for Li-ion manufacturing facilities in 2015

✘ This last month and a half has been rather lacklustre for the graphite sector as a whole but the demand and prospects for this material should improve noticeably in 2015. When considering the market for graphite it is important to note the main reason for its demand. Graphite contains carbon, which is the element that gives a diamond its strength. It is the strongest material in the world, yet it is also soft and malleable at the natural flake graphite state. Carbon also makes graphite extremely heat resistant, electrically and thermally conductive, chemically inert and lighter than aluminum. These characteristics are what make graphite so important – and this is before graphene even remotely enters the discussion. Moreover, carbon and graphite materials play an important role in traditional production processes while serving as one of the very bases of future technologies. Graphite electrodes are essential components in the world's largest single recycling process, which is the melting of scrap metal to make steel while coarse-grain graphite cathodes are used in the aluminum production process and furnace linings.

Higher grade flake graphite is needed to produce anodes, one of the key components of lithium-ion batteries, used anywhere from a Toyota Prius to a Boeing 787 airliner. Fuel cells also contain carbon in the form of gas diffusion layers. High purity graphite also finds its way into solar cells and semiconductor layers for LED manufacturing. And then there is

that whole other graphite side related to the rise in demand for a new generation of lightweight materials: composite materials based on carbon fibers. Carbon fibers have a diameter of only one-tenth the thickness of a human hair, but are extremely strong; they are woven in a textile fashion and mixed with a polymer matrix, hardened form carbon fiber composite materials that are strong as steel but much lighter. They are increasingly being used in cars while they have started to replace aluminum in aerospace – the Boeing 787 and Airbus 350X, two of the most advanced jetliners in the world, make extensive use of carbon fiber enhanced plastics. Graphite is also corrosion-resistant, which makes this material an ideal replacement and cost saving alternative to the use of steel reinforcement in the construction industry (and of course graphite is both a component of steel alloys and a refractory agent in its manufacturing process).

The graphite market will be ever more competitive market and one of this year's protagonists was Tesla Motors, an emerging and popular California based electric vehicle manufacturer. In February 2014, Tesla announced that it would build a factory to produce lithium-ion (Li-ion) batteries, with a projected USD\$ 5 billion investment; the so-called 'Gigafactory' could increase graphite demand by more than 30% in 2020. Tesla wants to secure a North American natural graphite source, which provided one of the more exciting aspects of following the graphite market in 2014, as speculation started to build as to which potential producer tesla would use. Tesla's influence in the graphite market should be rather intense in 2015 because CEO, Elon Musk, delivered a series of announcements indicating that the Gigafactory project would be ready ahead of schedule.

In 2015, Tesla will be driven to sign agreements with the mining and metallurgical companies involved in the production of graphite. Moreover, Tesla's competitors such as LG Chem or Foxconn Technologies and Hitachi will be launching their own

Li-ion manufacturing facilities, which are likely to be based in China, where there is concern that the availability of its home sourced graphite could start to decline because of growing environmental and regulatory changes to the mining industry being imposed by Beijing. In early 2014, graphite production in China was brought to a halt for environmental reasons. Although the production cuts have not yet translated to an increase in graphite's market value, this is a matter of time because the concern now is graphite supply might be unable to address world demand in the near future. There should also be rising demand in more basic graphite markets such as refractories because one of the effects of lower oil prices would be increased consumer demand and rising Chinese and European manufacturing, prompting more steel production. Graphene, directly related to flake graphite, will continue development and serve as a reminder of graphite's potential. It is unclear what effects the lower oil prices will have on the world economy. Many, and myself included, see the development as favorable for stimulating consumer demand and manufacturing in the rich countries.

History has provided some clues to this effect. In 1986, oil prices were halved almost overnight after OPEC chose not to control supply, triggering a global economic surge that accelerated global growth to a peak of 4.6 per cent in 1988, a rate that would not be achieved again until 2000. Though a boost to global industry is desirable, there are no guarantees that cheap oil will perform an economic miracle but there is some optimism in the iron ore sector, which is good for graphite. The economy of Australia, the largest exporter of iron ore in the world, suffered a severe blow from the crisis in the market for iron ore and the same national currency, the Australian dollar was dragged down. However, there are well-founded hopes that during 2015 the consumption of ferro-alloys and special steels will be reflected in better performing market given that the automotive industry has seen an increase in demand that is expected to continue throughout 2015, aided

by the fall in oil prices.