# Meanwhile, Back in Tokyo

The Japanese have been very busy for at least the last 15 years attempting to construct, expand, and maintain a total rare earth supply chain for the Japanese domestic manufacturing industry, so that it can break free of China and Chinese involvement. Recent moves by Japanese rare earth permanent magnet (REPM) makers, such as, for example, Hitachi, to move some production to China a step that Hitachi, among others, said just 4 years ago, that they wouldn't do – has been interpreted I think wrongly as a "surrender" to the inevitable dominance of China in the sourcing of raw materials for rare earth permanent magnets. In fact, I suspect that even though Hitachi most likely moved production of commodity (i.e., wide-spec or no spec) REPMs to China, it has, in true Japanese fashion, kept the production of specialized proprietary tight-spec REPMs as well as R&D for REPMs at home, or close to home but not in China.

Hitachi, as an example, is a Tier One supplier to the German OEM automotive transmission supplier, ZdF at its, ZdF's,manufacturing plant in China Grove, North Carolina. REPM alloy made, I suspect, in both China and Japan is shipped from those places to Malaysia where the blocks are machined to shape. Then the shaped magnet alloy is shipped to North Carolina where it is installed and magnetized in ZdF automatic transmissions for, among others, the Ford Motor Company. I doubt that Malaysian labor rates and utilities are much cheaper than their equivalents in mainland China but I think they are no more or not much more than Chinese rates for the

same overheads. Malaysia, however, offers Hitachi an added value, a venue where its trade secrets can be less likely to be stolen. Additionally, and perhaps most important of all, the Malaysian machining facility can switch suppliers without political fallout. Magnet alloy made in Japan, Vietnam, or even one day Malaysia or the USA can be substituted for Chinese made material at any time.

The recent fuss over the operating license for Lynas LAMP facility in Malaysia was due to a previous attempt by Japan's Mitsubishi to process local monazite bearing sands for rare earths in the late 1990s. The result of that venture was a fiasco where the Malaysian government had to pay a substantial sum along with Mitsubishi to clean up a thorium residue issue, and the project was terminated. This did not endear either rare earths or Mitsubishi to Malaysian regulators, and the residue of ill will was the main driver behind the ludicrously named Save Malaysia Stop Lynas movement that held up the license for the LAMP for at least two expensive years.

Nonetheless the Japanese REPM industry has for the last two years been looking at the viability of Malaysia for additional supply chain development due to the availability of didymium from the LAMP and of terbium and dysprosium from xenotime extracted from tin processing residues and from ionic adsorption clays in Sarawak (Malaysian Borneo).

Nearby to Malaysia in Vietnam there is already a variety of Japanese investment in a total rare earth supply chain. The REPM manufacturer, Shinetsu has a magnet alloy/magnet plant there using, among other feed stock, REPM scrap. The Japanese magnet alloy producer, Showa Denko, also has an operation in Vietnam. Toyota operates a plant in Vietnam recovering rare earths from Nickel Metal Hydride batteries as does, I believe, Honda. Toyota is also a principal investor in the development of the Dong Pao rare earth deposit in Vietnam and if and when production begins there it can be apportioned for separation to the two Chinese owned total rare earth separation

facilities already operating in Vietnam as well as to the Shinetsu, Showa, and Toyota facilities with separation capabilities and/or alloy and or magnet making capacity. There are at least four solvent extraction plants in Vietnam for the separation of rare earths.

Toyota is also a principal investor in the large (8000 ton per annum capacity) monazite fed separation plant in Kerala, India that is either ready for operation or in operation today.

In Brazil Mitsubishi and/or Sumitomo is processing tin-processing tailings from Pitinga to extract some of the substantial xenotime resident in it. I believe that the separation processing of this xenotime is done in Vietnam, but it may be done in Japan or even China for the account of Mitsubishi's Japanese clients.

In North America we know that Toyota's trading company took a position in Matamec and has looked extensively at many other properties, but politics and environmental issues seem to have inhibited any further Japanese investment in North America.

The Japanese REPM industry has voted with its pocketbook and its engineers for involvement in the global rare earths trade. The purpose of all of this is to make Japanese REPM manufacturers independent of the Chinese total rare earth supply chain.

**The USA is very far behind the Japanese in this.** Basically this can be ascribed to two reasons:

1. The demand for REPMs in the USA as component parts of goods to be assembled in the USA is less than 1000 tons per year, and
2. No one has re-established even a minimal total domestic American rare earth supply chain here since Magnequench departed.

What the USA needs right now is a 500-1000 ton capacity total

rare earth supply chain that is profitable at current pricing. Such an operation would seed a larger capacity supply chain when it becomes necessary due to Chinese internal absorption of their entire output or a real cutoff of our supply, whichever comes first.

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# Grafoid secures significant partnership with one of the largest companies in Japan – Mitsui Co. Ltd.

On March 24, Grafoid Inc., part of Focus Graphite ('Focus', TSX.V: FMS | OTCQX: FCSMF), announced that it has signed a two-year memorandum of understanding (MOU) with Mitsui Co. Ltd.'s 'Advanced Materials Division'. The agreement provides for the parties to jointly commit to a one-year detailed market feasibility study to identify and evaluate market opportunities for graphene before the formalization of industrial and development projects in Japan.

Grafoid has an expanding and pioneering array of graphene developments backed by ventures and intellectual property rights, bringing graphene ever closer to commercial reality such as its MesoGraf™ series. Grafoid and its parent Focus Graphite have also been involved in advanced applications for lithium iron phosphate (LiFeP) battery materials in partnership with Hydro-Québec and the development of graphene-based repayment cancer therapies in partnership with Calevia Inc.

MesoGraf™ ('MesoGraf') represents nothing short of the first

platform for the industrialization and commercialization of graphene. Stories about graphene's novel applications and their potential are published daily around the world. MesoGraf, therefore, represents the first tool through which to achieve graphene's potential, bridging the gap between the growing bodies of graphene research with actual commercialization of the material, essentially making the science available to the market. Until now, graphene has been limited to development and study in the laboratory; commercial scale applications have not yet been possible. Mitsui asked Grafoid if it could test MesoGraf and the result is an agreement that will allow Grafoid and Mitsui to join efforts in searching for joint venture application partnerships within Japan.

The alliance with Mitsui is very significant; indeed, Mitsui Co. Ltd. is one of the largest of the seven traditional large trading companies ('sogo shosha'). It is the largest company of the Mitsui Group and one of the largest companies in Japan. In its present form, the company was established in 1947 and now has 161 offices in 68 countries and 565 worldwide subsidiaries. Mitsui, like the other 'Soshas' is a generalist and deal in all manner of raw materials, intermediate products, finished products and services, be it chemicals, textiles, power plants and other large-scale systems and electronics. Their importance and power is due to unrivaled distribution networks, which support the sales of Japanese products and services around the world. This support also comes in the form of finding raw materials needed by Japanese industry to advance.

This is an ideal partner for Focus and Grafoid. Mitsui will likely use its channels and network to introduce graphene to Japanese battery manufacturers like Hitachi or Panasonic as well as automotive groups like Toyota or Nissan. MesoGraf has the potential of becoming the standard 'go-to' graphene material. MesoGraf was developed in a USD$ 100 million

research facility at NUS by Dr. Loh Kian Ping and Grafoid co-founder Dr. Gordon Chiu. The main difference between MesoGraf and all other attempts at developing a graphene material is that MesoGraf is finally able to offer the scalability that is needed to bring the material's potential to the market. A scalable graphene material implies that it can be made to address a large increase in users and applications without undue effort. Scalability has been the 'weak link' in graphene until now. MesoGraf will be derived using natural flake graphite ore from Focus's Lac Knife deposit in Quebec in a patented one-step process. Even this process is 'scalable' because, it can use any graphite ore with 10% or higher purity according to Focus.

The Province of Quebec and Japan have signed further collaboration agreements related to battery technology and materials, which will surely benefit Focus and Grafoid. Indeed, the Research Institute of Hydro -Québec (IREQ) and the Japanese group SEI Corporation have joined forces to commercialize a new technology in the field of Li-Ion batteries, complete with their own patents. Graphene coated anodes improve battery performance, providing better electrical connections between nanoparticles. When used with silicon, the graphene coats and protects it from direct contact with the electrolyte, slowing the chemical aging of the electrode. That is merely one advantage of graphene in batteries; and batteries are merely one application for graphene. The possibilities are endless.