MRL Corporation Ltd

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MRL Corporation Limited
ACN 007 870 760
ABN 50 007 870 760

Registered Office
Suite 3
9 Hampden Road
Nedlands WA 6009
Tel +61 1300 660 448
Fax +61 1300 855 044

Directors
Craig McGuckin
Peter R. Youd
Denis Geldard
Peter Hepburn-Brown
Joel Chong

Company Secretary
Peter R. Youd

Email: info@mrltd.com.au

Website: www.mrltd.com.au

ASX Symbol
MRF, MRFOA

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MRL receives outstanding results from graphene testing

Results provide significant boost to the already-robust economics of MRL's high-grade Sri Lankan graphite projects

MRL Corporation (ASX: MRF) is pleased to advise it has received outstanding results from the test work conducted on its Sri Lankan graphite and its properties for scalable graphene production. Key observations made in the report presented to the Company were;

- The tests were conducted to check for the amenability of the ore for single step extraction of graphene.
- The quality of the prepared graphene from MRL's graphite is outstanding and comparable with the quality of graphene prepared by synthetic routes.
- MRL's graphite has very high crystalline carbon content not observed in any other previously tested graphite materials.
- A number of processes were tested with electrochemical exfoliation providing the best results. This process route was stated to be scalable and therefore suitable for commercial scale production of single and few layered graphene directly from the graphite ore.
- The Company will now consider the merits of producing both graphite and graphene in its development plan. Discussions will be initiated with a number of research organisations to optimise that route to production.

Combined Thermal and Mechanical Process

This method is used to isolate graphene directly from raw graphite (after milling) and without having to produce graphene oxide.

This test generated single layered graphene sheets with excellent quality and low defects, which was confirmed by the Raman shift curve.

The quality of graphene prepared by this method is comparable with graphene prepared by the synthetic method and the best quality graphene available on the market from few suppliers.

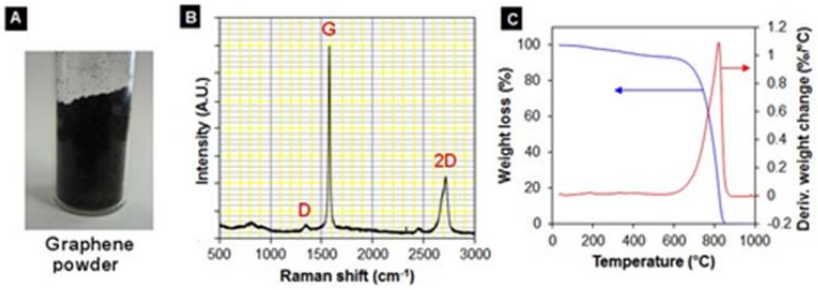

Figure 1. a) Digital photograph of graphene powder, b) Raman and c) TGA plots of graphene prepared from the developed method.

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Electrochemical Method

The electrochemical method is another promising method for the direct and scalable production of graphene from raw graphite.

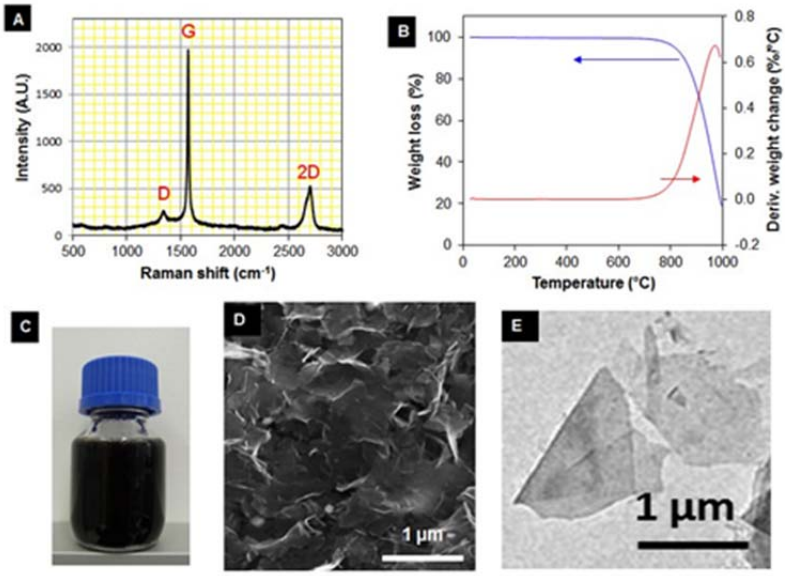

Figure 2 a-b) Raman and TGA spectra of graphene, c) Graphene solution, d) SEM, and e) TEM images of the graphene sheets electrochemically removed from the process.

Graphene was successfully extracted from raw MRL graphite using direct electrochemical exfoliation without having to purify the material. The quality of graphene (single to several layer thickness and low defects) prepared by this method is comparable with graphene prepared by synthetic method.

Summary of Characterisation and Graphene Exfoliation Methods

The thermal treatment and electrochemical exfoliation of raw graphite is much more efficient to produce bulk graphene as it is a fast process, without the use of toxic chemicals minimising waste and more importantly produces graphene with outstanding quality, as confirmed by Raman characterisation. Both of these processes are also scalable and can be implemented into industrial production.

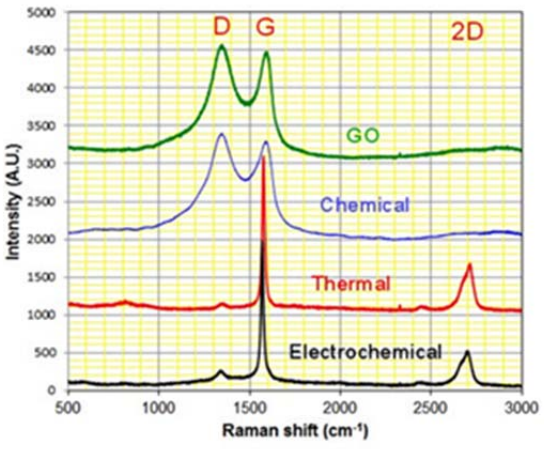

Figure 3. Comparative Raman spectra of graphene and GO prepared by the three methods confirming the quality and integrity of its structure.

MRL Managing Director Craig McGuckin said these results have been a significant advancement in the Company's steady march towards production and development of high end graphite and graphene products.

"While we had always been confident our Sri Lankan graphite would produce high quality, low defect graphene it is an excellent result to have this independently confirmed. From Run of Mine ore through to spherical graphite for Lithium Ion batteries to the production of graphene all the material we can mine can be sold into traditional and high value markets. This places MRL in a position unequalled by graphite projects in any other country." Mr McGuckin said.

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About MRL Corporation Ltd (ASX: MRF)

MRL is aiming to develop an underground mining operation to extract high-grade, crystalline vein graphite, which is unique to Sri Lanka. The Company holds exclusive rights to exploration licenses covering approximately 6,300 hectares in area, with historical workings located within nearly all license grids.

About Graphene

Graphene, the well-publicised and now famous two-dimensional carbon allotrope, is as versatile a material as any discovered on Earth. Its amazing properties as the lightest and strongest material, compared with its ability to conduct heat and electricity better than anything else, mean it can be integrated into a huge number of applications. Initially this will mean graphene is used to help improve the performance and efficiency of current materials and substances, but in the future it will also be developed in conjunction with other two-dimensional (2D) crystals to create some even more amazing compounds to suit an even wider range of applications.

One area of research which is being very highly studied is energy storage. Currently, scientists are working on enhancing the capabilities of lithium ion batteries (by incorporating graphene as an anode) to offer much higher storage capacities with much better longevity and charge rate. Also, graphene is being studied and developed to be used in the manufacture of supercapacitors which are able to be charged very quickly, yet also be able to store a large amount of electricity.

About Graphite

Natural graphite occurs in three forms: amorphous graphite, flake graphite and the most rare and highest quality form being crystalline vein graphite. Sri Lanka is famed for being the only commercial producer of crystalline vein graphite (lump or Ceylon graphite), the highest quality of naturally occurring material in the world. The quality of vein graphite produced in the country has a purity level in excess of 90% TGC (Carbon as graphite) which means little upgrading and processing is required to make a high quality saleable product.

Amorphous (micro crystalline) graphite is the least pure form of naturally occurring graphite and commercial deposits usually have a carbon content of 70-85%, and are found as lenses or lumps with flat fracture cleavages. It is normally formed by metamorphism of previously existing anthracite coal seams.

Flake (crystalline) graphite is the more common form of graphite and typically has carbon content in the range of 80-99%, and is usually formed in metamorphic rock in concentrations of 5%-12% of the ore body. Mining and processing of these deposits is similar to open pit gold or copper mines, requiring 'large scale' mining and processing to extract the graphite. Large-scale mining and processing plants typically equates to high capital expenditures and

For further information:

Craig McGuckin

Managing Director

MRL Corporation Ltd

Peter R. Youd

Executive Director

MRL Corporation Ltd

www.mrltd.com.au

relatively high operating costs.

Vein (crystalline) graphite is the purest form of graphite with TGC grades typically >90%, with some grade as high as 99.5% TGC. Mining vein graphite may be considered analogous to high-grade gold vein mining, requiring considerably less capital expenditure when compared to large-scale open pit mining. That is, development, mining equipment and processing plants will be of a significantly smaller scale. Operating unit costs will also be lower than those for typical large-scale open pit mining.

Nature of vein graphite

Sri Lankan graphite deposition model is best described from the 'bottom up': tension fractures formed in the metamorphic sediments, caused by the folding of the sediments, creating 'conduits' for the hydrothermal deposition of high quality vein graphite. Historically, mining of these veins has found the veins generally increase in thickness and grade quality with increasing depth. Graphite veins generally dip steeply at –70° to near vertical, enabling 'narrow vein' extraction mining techniques similar to those used on narrow vein, high-grade gold deposits. The method commonly used is an overhead retreat stoping technique where the high-grade vein graphite is mined and hauled to surface without contamination. The graphite selvages, in contact with the surrounding waste, is hauled to surface and stockpiled for upgrading. The balance of the waste is used to fill the floor of the stope.

Due to the nature of the vein graphite, it is anticipated vein widths of ~25cm, using narrow vein mining techniques can be economically extracted from underground operations.

THIS ANNOUNCEMENT EFFECTIVELY CEASES THE TRADING HALT REQUESTED BY THE COMPANY ON 11 MAY2015. THE COMPANY IS NOT AWARE OF ANY REASON WHY THE ASX WOULD NOT ALLOW TRADING TO RECOMMENCE IMMEDIATELY.

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