

15 October 2016

On Friday's Close

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Explaining FGR's and vein graphite's competitive advantages

Coking price locks in to recent highs

We have seen an extraordinary 117% rise in coking coal prices over the last few months. The first response to such a rise might be to say that it is unsustainable, but think again. Japanese steelmakers have just agreed that they will pay US\$200 pt for the next three months compared to US\$81 pt in the March quarter. What dramatic turnaround!

Most investors haven't yet jumped onto the bandwagon, perhaps because of uncertainty as to which are the best stocks to buy. A few years back there were quite a few companies with coking coal projects in exotic countries. Mongolia was a hot destination with Aspire Mining being a well promoted company. Tigers Realm Coal (TIG) was also making progress with its projects in the far east of Russia. Atrium (ATU), Bathurst Coal (BRL), Centennial, Cokal (CKA), Jameson (JAL) and Stanmore (SMR) were also common names. Money is flowing back into the sector. So far the most recent entrant to the sector, Pacific American Coal (PAK), is still largely unrecognised.

One of the best performing mining stocks last week was BHP, indicating that big money is flowing back into this market leader, probably on the back of the improving coking coal and oil prices.

Explaining why First Graphite will be lower cost than any other graphene producers

Normally I don't bother with the usual noise emanating from chat sites like Hot Copper but there are times when some of the misguided souls need firmer direction. It is unhelpful when they promote views that are not well founded. (NB: I have never been on Hot Copper, but clients sometimes tell me what is going on).

The difference between flake graphite and vein graphite

There seems to be some confusion as to what FGR is really doing and where it fits into a competitive market, so I will explain it one more time. The Sri Lankan vein graphite is a premium product that is very different to all the flake graphite markets. Everywhere else in the world a graphite mine starts with a grade of between 5% and 15% (with some exceptions). The ore has to be mined and run through a processing plant that could cost anywhere from \$50m to \$200m, depending on scale. The low grade ore has to be concentrated into a saleable product, usually > 95% TGC. This can involve many steps beginning with crushing and grinding, followed by multiple stages of flotation, concentration and regrinding to remove impurities while at the same time trying not to reduce flake size below acceptable sizes. Some mines will require a further chemical-based stage to clean out the remaining deleterious elements before a saleable product is achieved.

Commissioning risk of large scale plants

All of these steps cost money and can require very precise process management. Success in a laboratory, under very controlled conditions, is much easier than trying to do it in a commercial size operation. This scaling up will challenge any new mine and not all mines will be successful. A critical

point that all investors in the new wave of flake graphite hopefuls need to understand is there is virtually no experience in building and operating graphite mines in any ASX listed company. It is a steep, and probably expensive, learning curve. Never overlook commissioning risk.

Converting graphite concentrates to graphene

Once a saleable graphite concentrate of 96-99% has been produced it is ready for the market. It may also be used for graphene production by applying a number of processing methods. The preferred process and the quality of the graphene will depend upon the metallurgical characteristics of the graphite concentrate. Not all processes are commercially or environmentally acceptable even if they are technically possible. The most cost effective and environmentally safe method is electrochemical exfoliation. The important point to remember is that it will be an expensive process for a flake graphite producer to upgrade its material before it can even consider the next step of making graphene. It won't be worth it.

Vein graphite circumvents all of the concentrating costs

Vein graphite comes out of the ground at 95% +. Natural processes have taken care of all the enrichment and concentrating steps referred to above so that a vein graphite miner doesn't have to spend all that money building an expensive treatment plant. It doesn't have to move millions of tonnes of ore and waste so its operating costs will be much lower. The trade-off is that tonnages are smaller in narrow high-grade mines, and the JORC standard is not compatible with narrow high-grade mines (ask any high-grade underground gold producer), but that shouldn't worry an operator who is dealing with much higher profit margins. The objective should not be to become the biggest gorilla in the sector. It should be to earn the best return on capital at the lowest capital and operating cost risk. If a company can achieve this it will minimise financing dilution and it will be able to avoid punishing debt on the balance sheet. Shareholders will own the mines, not the banks.

FGR is the only vein graphite company that is delivering

As a vein graphite miner FGR is very different to all of the flake graphite companies. It is currently developing the first three shafts in Sri Lanka and will soon have saleable, 95% TGC product from its own mines. In the interim it has secured a third party supply of like-for-like product so that it can push ahead with securing customers, not dependent upon the rate of own mine development.

At this ultra-high grade you could say that this is like dealing with a concentrate, but it is the run-of-mine (ROM) product. It won't have any of the metallurgical issues or deleterious materials though, that come from the underlying geology of flake deposits. Mining underground does require more specialist skills, and the development of shafts and underground workings can throw up engineering challenges along the way, but experienced operators know how to handle these. Narrow vein underground mining is

expensive in Australia due to very high labour costs but in a country like Sri Lanka there is a distinct cost competitive advantage.

There is something further that needs to be understood about vein graphite. It is a very different commodity to flake graphite and flake graphite concentrates. It has unique high end properties that occur due to the crystalline nature and the very high temperatures at which it forms. It has only recently been learnt that vein graphite includes several different crystal types. Mesoporous graphite is a type that could offer breakthrough superconductor capabilities. This offers new openings that are yet to be fully understood or appreciated.

FGR's process for making graphene is the most efficient

All of the above comments relate to graphite. Now I will explain succinctly the process of conversion to graphene and the cost advantages with FGR's graphene production cell.

FGR can take its ROM ore and place it in the graphene cell. In a one step process over a 24 hour period it can convert approximately 80% of the graphite into graphene with average platelets sizes of 40-60 microns. This is much larger than the typical 3-5 micron size for CVD graphene, the primary source of graphene production in industry to date. The larger size makes the graphene easier to handle and easier to engineer.

Perhaps the simplicity of the process has to be seen to be believed. When scientists already involved in graphene are told about it for the first time they are usually astounded by the simplicity and the very low cost. The production cell costs no more than a small car. The capital cost is minimal. There is no need for units that cost hundreds of thousands or millions of dollars. The physical size is small enough to fit it into a tiny room. It is easy to transport. It can be added on to any production facility that wants to add graphene to its products without any major reconfiguration required. Thus it is very user friendly.

The graphene initially comes out in layers of three to ten layers in thickness, but if you want single layer thick graphene, the ultimate 2D material, FGR can run it through a secondary processing step to achieve that size.

There is nothing magical about the process other than the fact that it works (if you have the right feedstock). There is another ASX listed company that is using a similar methodology but the feedstock ore runs at 24% TGC, compared to the 95% grade for the vein graphite. The different metallurgy and the presence of other materials in the ore give much lower yields to graphene of about 10%, compared to 80% with the vein graphite. That means for each tonne of ore that the other company treats it recovers only 20-30 kg of graphene. The vein graphite gives you 800 kg per tonne, which leads to enormous savings in material handling and capital costs for the vein graphite.

It is all about the economics

At the end of the day the winner in the graphene production race will be the lowest cost operator (after the technical quality issues have been satisfactorily addressed).

FGR is in an enviable position. It should be able to make good profits from a standard graphite mining operation, producing and selling high value product for which there is no risk of oversupply. FGR is positioning itself to have a

commanding position in the supply curve as the lowest cost supplier.

The super profits will come from the graphene side of the business. We know that the graphene business is embryonic. It needs the development of more applications, particularly bulk use applications, before momentum really gets going, but all around the world scientists and industry are working to make it happen. The availability of high quality low cost graphene, such as that which FGR can supply, will greatly accelerate the commercialisation of graphene. It doesn't rely on FGR alone to develop applications. Any progress elsewhere, by any other organisation, will have positive implications for FGR. Its graphene probably won't be suitable for very expensive high end applications, that can afford to pay CVD prices, but that shouldn't matter. FGR is at the start of a very steep growth curve covering the entire value chain from mine to market.

FGR is not a cyclical stock that will be popular today and in the doldrums tomorrow. This is a growth stock that will benefit from structural changes in the development of industry materials over many decades. It is the stock you buy and hold to get a position in the future of materials. It is not a question of "if" as much as "when". How steep will the growth curve be and how rapidly will it develop?

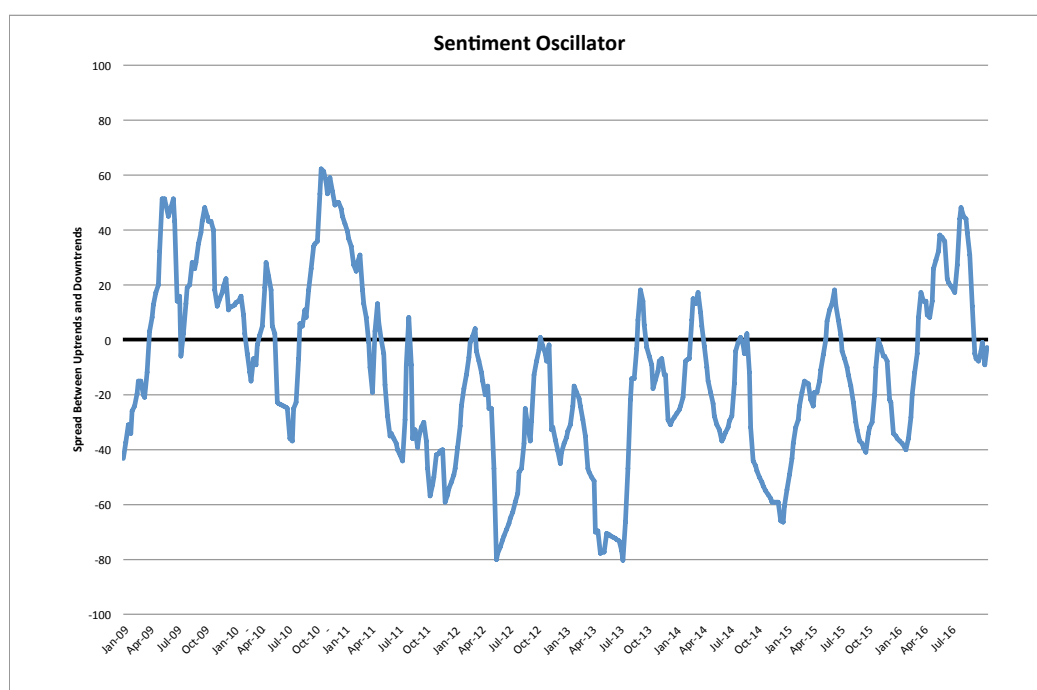
Some comments on terminology

One point that might need clarification concerns purities and grades. When you are talking about measures of purity or grades you are talking about graphite. A quoted grade refers to the graphitic content in ore. When you concentrate the ore you get a concentrate grade, which is also a purity measure, but when you get to this point you need to know more about what the impurities comprise. You need to know how problematic those last few percentage points will be in terms of contamination and possible compromising deleterious elements.

When you talk about graphene, it is either graphene or it isn't. There isn't really a grade or purity measure. An exfoliated graphene batch might have a small percentage of incompletely formed graphene, represented by micro-graphitic particles, which are incidental and not an impediment to the application.

Graphene measure is all about quality and size. Graphene can be single layer in thickness or that thickness could extend right up to ten layers. Another parameter to consider is the size of the graphene platelets. They can be small at 3-5 microns in size (length/width), or they can be as big as 100 microns. Further, a very important measure is the level of defects. Different methods of production, and different raw material sources, will give varying defects that will affect whether it is suitable for purpose or not. Raman spectroscopy is used to measure defects.

We have deleted Kingsgate from chart coverage given its extended suspension and certain future. Gryphon Minerals has been swapped for Teranga Gold (TGZ) following their merger.













































Sentiment Indicator: There was a useful improvement in sentiment last week with 32% (29%) of the stocks in uptrend and 35% (38%) in downtrend. The Sentiment Oscillator is showing some indecision on the chart, above.

Detailed Chart Comments

















































NB. Only the bold comments have been updated. Comments in grey type are from previous weeks and will be less relevant.

Indices	Code	Trend Comment	
All Ordinaries	XAO	through resistance line	
Metals and Mining	XMM	rising again	
Energy	XEJ	strongly higher	
Stocks	Code	Trend Comment (updated comments in bold)	Main Interest
ABM Resources	ABU	holding longer term contract	gold
Aeon Metals	AML	off its highs	copper + cobalt
Alacer Gold	AQG	correcting lower	gold – production
Alkane Resources	ALK	back to highs	gold, zirconia
Acacia Resources	AJC	Sideways at the bottom	coal
Aguia Resources	AGR	new uptrend starting	phosphate
Alicanto Minerals	AQI	heavy correction	gold exploration
Attech Chemicals	ATC	down	industrial minerals
Anova Metals	AWV	new high	gold
Antipa Minerals	AZY	testing downtrend	gold
Archer Exploration	AXE	downtrend	graphite
Argent Minerals	ARD	breaching uptrend	polymetallic
Atrum Coal	ATU	heavy pullback	coal
Aurelia Metals	AMI	testing downtrend	gold + base metals
Auroch Minerals	AOU	rallied to meet resistance line	exploration
Aus Tin	ANW	breached uptrend	tin, cobalt
Australian Bauxite	ABX	turned down at resistance	bauxite
Australian Vanadium	AVL	downtrend	vanadium

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Avanco Resources	AVB		hitting resistance line	copper
AWE	AWE		Breaching downtrend	oil and gas
Azure Minerals	AZS		hitting resistance line	silver
BHP	BHP		strongly higher	diversified
Base Resources	BSE		sideways to higher	mineral sands
Beach Energy	BPT		steeply rise	oil and gas
Beadell Resources	BDR		testing uptrend	gold
Berkeley Resources	BKY		new high	uranium
Blackham Resources	BLK		testing support line	gold
Broken Hill Prospect.	BPL		breaching downtrend	minerals sands, cobalt
Buru Energy	BRU		testing downtrend	oil
Canyon Resources	CAY		down	bauxite
Cardinal Resources	CDV		new high	gold exploration
Carnegie Wave	CWE		stronger	wave energy
Cassini Resources	CZI		continuing higher	nickel/Cu expl.
Chalice Gold	CHN		new high	gold
Consolidated Zinc	CZL		new low	zinc
Coventry Resources	CYY		ST down	copper
Crusader Resources	CAS		new low	gold/iron ore
Dacian Gold	DCN		testing uptrend	gold exploration
Danakali	DNK		breaching support	potash
De Grey	DEG		sideways	gold
Doray Minerals	DRM		down	gold
Duketon Mining	DKM		rallying	nickel
Eden Energy	EDE		falling again	carbon nanotubes in concrete
Energia Minerals	EMX		down	zinc
Evolution Mining	EVN		down heavily	gold
Excelsior Gold	EXG		collapse	gold
First Australian	FAR		sideways	oil/gas
First Graphite	FGR		testing ST resistance line	graphite
Fortescue Metals	FMG		new high	iron ore
Galaxy Resources	GXY		heavy fall	lithium
Galilee Energy	GLL		breached downtrend	oil and gas, CBM
Gascoyne Resources	GCY		breaching support	gold
Geopacific Res. Resources	GPR		breached downtrend	copper/gold exp.
Global Geoscience	GSC		heavy fall	lithium
Gold Road	GOR		breached uptrend	gold exploration
Goldphyre	GPH		short term down	potash, gold
Graphex Mining	GPX		breached downtrend	graphite
Herron Resources	HRR		at highs	zinc
Highfield Resources	HFR		rallying	potash
Highlands Pacific	HIG		sideways around lows	copper, nickel
Hillgrove Resources	HGO		coming off high in a retracement	copper
Hot Chilli	HCH		testing downtrend	copper
Iluka Resources	ILU		falling	mineral sands
Image Resources	IMA		down	mineral sands
Independence	IGO		rallying	gold, nickel
Intrepid Mines	IAU		sideways - 7¢ capital return proposed	copper
Karoo Gas	KAR		rise from lows	gas
Kibaran Resources	KNL		holding long term uptrend	graphite
Kin Mining	KIN		higher	gold
King Island Scheel.	KIS		new low	tungsten
Kingsrose Mining	KRM		rising off lows	gold
Legend Mining	LEG		breach of gentle dwontrend	exploration

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Lithium Australia	LIT		downtrend	lithium
Lucapa Diamond	LOM		recapturing uptrend	diamonds
Macphersons Res.	MRP		sideways	silver
Manas Resources	MSR		rising	gold
Medusa Mining	MML		still in long term downtrend	gold
Metals of Africa	MTA		breached downtrend	zinc expl/graph.
MetalsX	MLX		breached support line	tin, gold
Metro Mining	MMI		correcting within uptrend	bauxite
Mincor Resources	MCR		fallen to support line	nickel
Mineral Deposits	MDL		correcting lower	mineral sands
Mustang Resources	MUS		softer	diamonds, rubies
MZI Resources	MZI		breached uptrend	mineral sands
Northern Minerals	NTU		rising	REE
Northern Star Res.	NST		sell down	gold
Oceana Gold	OGC		down	gold
Oklo Resources	OKU		ST down	gold expl.
Orecorp	ORR		on support line	gold development
Orinoco Gold	OGX		down	gold development
Orocobre	ORE		down	lithium
Oz Minerals	OZL		testing uptrend	copper
Paladin Energy	PDN		down again	uranium
Pacific American Coal	PAK		breached uptrend	coal, graphene
Pantoro	PNR		breached steepest uptrend	gold
Panoramic Res	PAN		rising	nickel
Paringa Resources	PNL		strong recovery	coal
Peel Mining	PEX		gentle uptrend	copper
Peninsula Energy	PEN		falling again	uranium
Perseus Mining	PRU		breaching downtrend	gold
Pilbara Minerals	PLS		falling	lithium/tantalum
PNX Metals	PNX		strong surge	gold, silver, zinc
Potash West	PWN		falling	potash
Red River Resources	RVR		surge to new high	zinc
Regis Resources	RRL		testing uptrend	gold
Renaissance Min.	RNS		new high	gold
Resolute Mining	RSG		breached support line	gold
Reward Minerals	RWD		strong rise	potash
Rex Minerals	RXM		back to lows	copper
RIO	RIO		strongly higher	diversified
RTG Mining	RTG		breached support line	copper/gold
Rum Jungle	RUM		sideways	quartz
Salt Lake Potash	SO4		steeply higher	potash
Saracen Minerals	SAR		down	gold
St Barbara	SBM		down	gold
Sandfire Resources	SFR		stronger	copper
Santana Minerals	SMI		breached uptrend	silver
Santos	STO		bouncing	oil/gas
Sheffield Resources	SFX		fallen back to support	mineral sands
Silver City Minerals	SCI		down	base metals
Silver Lake Resources	SLR		down	gold
Silver Mines	SVL		down	silver
Sino Gas & Energy	SEH		sideways to down	gas
Southern Gold	SAU		uptrend continuing	gold
Sundance Energy	SEA		new uptrend confirmed	oil/gas
Syrah Resources	SYR		heavy fall	graphite

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Talga Resources	TLG	Amber	sideways	graphene
Tanami Gold	TAM	Green	new high	gold
Teranga Gold	TGZ	Amber	testing uptrend	gold
Tiger Resources	TGS	Red	back to lows	copper
TNG Resources	TNG	Green	surge through resistance	titanium, vanadium
Torian Resources	TNR	Red	down	gold expl'n
Toro Energy	TOE	Red	downtrend	uranium
Troy Resources	TRY	Red	secondary downtrend	gold
Tyranna Resources	TYX	Green	pullback	gold exploration
Vimy Resources	VMY	Red	down	uranium
West African Resources	WAF	Amber	rallying	gold
Westwits	WWI	Amber	breached ST downtrend	gold exploration/development
Western Areas	WSA	Green	pullback	nickel
White Rock	WRM	Red	down	silver
Whitehaven Coal	WHC	Green	new high	coal
WPG Resources	WPG	Amber	improving following placement	gold
Wolf Minerals	WLF	Red	continuing down	tungsten
Totals	32%	46	Uptrend	
	35%	49	Downtrend	
		142	Total	

Guides to Chart Interpretations

- Charts usually go pass from one trend (up or down) into the other via a period of indecision and uncertainty during which the trend can either recover or change. This period is signified by the orange colour. The orange represent both the greatest risk and greatest reward possibilities.
- Once a chart is in confirmed up or downtrends it is not uncommon for 10-20% of that trend to have already transpired.
- There are trends within trends. The focus of this chart review is the immediate trend that affects the sentiment i.e. it can be a downtrend within a long-term uptrend.
- Not every chart warrants a new comment every week. The new comments are in bold type. Grey type comments may be dated.
- Individual charts provide a single view. It is valuable to look at charts of other companies in similar commodities, and the overall sentiment is also very valuable. Not many stocks can swim against the tide.
- We periodically add or delete charts, some times for obscure reasons. If a chart consistent gives poor signals or is very erratic, we may delete it. Sometimes we add a chart because we want to see what all the fuss is about. We do have a preference for charting stocks that we cover in our research as well.
- Errors and omissions may occur from time to time, especially in fast moving markets.

Amber Lights in Tables: Just a reminder if when the amber light is used in the table – it is when the charts are ambiguous or when there is a change of trend taking place. If a chart is breaching a downtrend it can either be a positive sign or a trap. Only once it has done more work can it be confirmed as a new uptrend. Maybe it is a new uptrend (or conversely a new downtrend); the risk takers can decide to jump on board early (or sell). They will maximise their profits (or minimise their losses if indeed it is the start of the new uptrend (downtrend). More risk-averse investors should wait a little longer, being prepared to give up some of the gains in return for greater certainty.

Weightings of Sectors Represented in the Company Charts			
Sector	No. of Companies	Weighting	
Gold	36	25.4%	
Copper	14	9.9%	
Gold Exploration	11	7.7%	
Oil/Gas	9	6.3%	
Potash/Phosphate	7	4.9%	
Mineral Sands	7	4.9%	
Graphite	6	4.2%	
Zinc	7	4.9%	
Silver	6	4.2%	

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Weightings of Sectors Represented in the Company Charts			
Lithium	5	3.5%	
Nickel	5	3.5%	
Uranium	5	3.5%	
Coal	5	3.5%	
Tin	2	1.4%	
Bauxite	3	2.1%	
Iron Ore	1	0.7%	
Diamonds	2	1.4%	
Other	11		
Total	142		

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