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Market Analysis Open Access

4th International Conference and Expo on Graphene Technologies and Carbon Nanotubes

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Explore Innovations in GRAPHENE 2020:

In spite of enormous improvements in GRAPHENE 2020 we are pleased to announce our GRAPHENE 2020, which is scheduled September 23-24, 2020 Milan, Italy

Market Analysis:

This report is the result of years of ongoing research. We launched the first version of our report on CNTs and graphene in 2011 and 2012, respectively. In addition to the initial research, we have organized 13 business-focused events on topic ourselves in Europe and USA; we have also since attended and/or lectured at 10 relevant non-IDTechEx conferences in Asia, Europe and USA; we have interviewed more than 140 players worldwide; we have delivered 12 masterclasses to business leaders; and we have completed 7 major consulting projects. All this gives us an excellent and unrivalled insight into these industries.

Carbon nanotubes: a brief overview

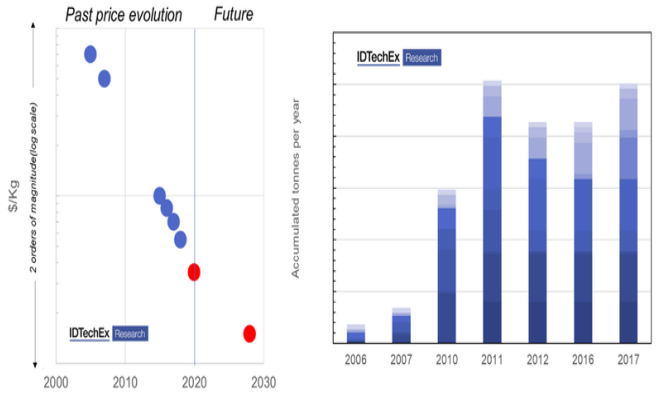
CNTs are almost thirty years old already. In this time, they have gone through almost the entire hype curve, rising from their academic origins toward their peak of hype before nearly disappearing into the valley of disillusionment. CNTs have however been making a quiet comeback and have now indeed entered a phase of volume growth.

As in graphene and many other similar carbon additive materials, there is no single type of CNT but there are many. The diameter of on-market CNTs range from near 1nm to several hundred, taking the CNTs from being singled-walled (SWCNT) towards multi-walled (MWCNTs) and carbon nanofibers. Similarly, the tube lengths range from few micro meters all the way to 2 millimetres.

Evolution of MWCNT markets: quietly entering the volume growth phase

MWCNTs are mainly produced using the C-CVD process (catalytic chemical vapor deposition). The evolution of accumulated global production for MWCNTs is shown below. Note here that the commercialization efforts start around 2005/2006. The super hype then sets in, leading to a rush to install capacity. This pushes the industry into a state of overcapacity, and still worse, pushes many to produce a CNT that is not good enough to meaningfully displace carbon black or similar.

Our analysis is now that the market has entered a period of volume growth. MWCNT use in conductive plastic applications is now well established and is expanding. It is also being added to new polymers like elastomers. More importantly, it is being used more in batteries. This is more important because the battery market is an escalator market in that it itself is poised for rapid growth thanks to uptake of electric vehicles demanding large batteries operating in high charge-discharge regimes.



Left: historical and projected price evolution of MWCNTs as a function time. The exact values have been removed in this figure but you can see that prices were reduced by nearly a factor of 100. Right: global accumulated production capacity as a function time, telling the story of the market evolution. Source: IDTechEx Research like graphene, CNTs are often a substitute additive. As such, they must compete on price and performance against the

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reference market values set by the incumbent. This gives rise to a perennial downward cost pressure. The industry has therefore had no choice but to cut cost of production. And in that regard, it has had good success.

This is shown in the chart here too showing the price evolution of CNTs. The blue dots show historic prices whilst red ones are our future projections: the learning curve is steep with prices having fallen by two orders of magnitude.

This competition on price and volume has largely commoditized the MWCNT supply business. We however do not mean that all differences in material quality have disappeared since many varieties of MWCNTs are on the market. The differences in quality, depending on application, will manifest themselves as small price differentials enabling the market to retain some of its speciality chemical character.

Sincerely,

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