How graphene can turn the space elevator fantasy into a reality

Adrian Nixon, Senior Editor at InvestorIntel in an interview with InvestorIntel Senior Editor, Jeff Wareham discuss the real possibility of building space elevators in the future. Currently for a human to travel into space, they must go by rocket. Not only is this process very dangerous but is also very expensive and presently the most cost effective way to travel into orbit currently runs USD$250k. For an industry currently valued at $300B, a space elevator would provide a competitive and much safer way to travel. In this interview, Adrian explains how the space elevator idea is over 100 years old and how scientists may potentially use graphene to turn this fantasy into a reality.

Jeff Wareham: Welcome back to InvetorIntel. I am actually here today with Adrian Nixon who is the Senior Editor for InvestorIntel. Adrian is going to talk about what I think is one of the truly unique subjects we will talk about on this program. What on earth is a space elevator?…to access the complete interview, click here

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NASA’s Graphene – Making holes within graphene

nanoplatelets

NASA got in touch with me. "Would I like to attend a briefing on a new graphene technology they had been working on?" The first thing I did was check up to make sure this was real. Yes it was the NASA Langley Research Center. So I joined a few others and listened attentively to what their scientists had to say about something they call holey graphene. Read on to find out more…

Dear InvestorIntel readers, you are sophisticated. So I'll spare the usual graphene introductions and assume you know all about graphene's amazing physical properties. I will draw your attention to one aspect of this material though. It is impermeable, even gases cannot pass through.

This impermeability is seen as an advantage because there are few other materials with this property. However there are situations where putting holes in graphene could be an advantage, such as making filters or electrodes for batteries and supercapacitors.

Graphene porosity currently means gaps between nanoplatelets

Regular readers will know about graphene filters, for example Manchester University has created a filter that can remove the salt from seawater.

They achieved this feat by making the filter from graphene nanoplatelets that were pressed together. Think of the nanoplatelets as stacks of playing cards viewed edge on. Water can be forced through the gaps between the layers, however salt molecules cannot pass through these gaps and this creates the separation effect.

Making holes within graphene nanoplatelets

Creating holes in graphene nanoplatelets makes graphene permeable. Other teams have done this. For example punching holes with an electron beam, or etching with oxygen plasma. Both of these methods are effective on the small scale but complicated and expensive to scale up.

The NASA process

What NASA has done is to develop a simpler way of making the holes. In essence they dust graphene with a solid powder of silver nanoparticles. This dust clings to defects on the nanoplatelets surfaces. Then they introduce oxygen. The metal nanoparticles act as a catalyst completely oxidising the surrounding graphene to carbon dioxide and this creates the holes. Because the silver nanoparticles act as a catalyst they are unaffected by the oxidation and remain. So they dissolve the metal with acid. Then wash the acid away.

NASA has already shown that this increases the surface area and can catalyse the breakdown of hydrogen peroxide into hydrogen and oxygen. Other materials can do this so that is not unique.

So What?

The technology also relies on the graphene not being perfect. It needs to exploit defects in the graphene nanoplatelets. Regular readers will recall that near perfect sheets of graphene have been made by researchers in China. This single crystal graphene will not contain defects and so this process may not work as effectively on these new larger scale sheets that will emerge in the future.

Much was made of the applications of these holey platelets but I didn't see any evidence for them actually making a measurable difference to filtration or energy uses yet. This means the technology is yet to be proved as a leap forward over standard graphene nanoplatelets. However, the NASA process for making holey graphene is straightforward and should not add much cost to conventional graphene nanoplatelets. It should be scalable too, which is good from a commercial point of view.