Better roads with graphene

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As a driver, road works are not my favourite thing; I'll guess you don't have much love for road repairs either. So, dear reader, you may be interested to learn that graphene could rescue us from this fate. It looks like the wonder material may actually make our roads stronger and last longer. Read on to find out more…

Paved roads

Most of the roads we drive on are sophisticated, layered, pavement structures topped with asphalt. Asphalt is a mixture of aggregates, filler and a bitumen binder.

It is big business, Europe has over 4,000 asphalt production sides and over 10,000 companies are involved in asphalt production and laying. Global demand for asphalt is projected to expand at 2.8 percent per year to 122.5 million metric tons by 2019. This is a multi-billion dollar market.

Graphene nanoplatelets

As regular InvestorIntel readers will know, graphene nanoplatelets can be made from graphite. Graphite is a relatively common material on the planet and various companies have developed techniques for making bulk graphene from graphite. As the production is scaled up so the cost of the bulk graphene product comes down. The suppliers of bulk graphene nanoplatelets will be open to negotiation about the price.

Graphene has been developed as an additive in rubber tyres to increase the grip and wear resistance. So you might think that graphene could do the same for the surface the tyres run on. A

team at the University of Minnesota thought so too. In 2016 they published a report that examined whether graphene nanoplatelets could improve the performance of asphalt paving.

Graphene in asphalt

The Minnesota team added graphene nanoplatelets to asphalt in varying amounts and looked for improvements in strength performance. They also wondered if graphene could make the asphalt electrically conductive. They reasoned that an electric current could act as a signal that would turn the road surface into a sensor. So they ran a series of thorough experiments.

The lab results

The team found that low cost graphene nanoplatelets could be mixed with asphalt without major dispersion problems.

They also found that, compared with conventional asphalt mixtures, graphene nanoplatelet reinforced asphalt mixture specimens exhibit an improved strength and, in some cases, an increase in fracture energy. However the graphene addition did not improve the electrical conductivity of the asphalt materials.

The team thought that roads made with graphene-enhanced asphalt should be stronger and flex more in low temperatures. This combination would increase the life of a graphene enhanced asphalt road.

They found that to make the asphalt electrically conductive required levels of graphene higher than 6%. Beyond these levels the strength starts to decline so making asphalt crack sensors will need further work. The reason for the strength decline was

thought to be clumping of the graphene in the asphalt. The team thought that if the graphene could be better mixed into the asphalt this might get round the problem.

Real world trials

In the meantime similar work has been done by two italian companies. Directa Plus, a producer of graphene-based products, and Iterchimica, a manufacturer of asphalt additives. They estimate that adding graphene to asphalt can increase the life of the surface from the current six years to twelve years. They plan to test the product on several kilometres of road in Italy.

These further examples show just how fast the technology of graphene is moving to improve our lives.

If this work lives up its promise we will spend more time driving and less time waiting on our roads all thanks to little bits of graphene.