Bloomberg Businessweek

Innovation & Design

Europe Bets €1 Billion on Graphene to Lead a Tech Renaissance

Posted by: Bernhard Warner on February 08, 2013
http://www.businessweek.com/articles/2013-02-08/europe-bets-1-billion-on-graphene-to-lead-a-tech-renaissance

Lighter than a feather, stronger than steel, a superior electrical conductor to copper: According to its champions, graphene could unlock a new era of super-energy-efficient gadgets, cheap quick-charge batteries, wafer-thin, flexible touchscreen computing, and a sturdier light-weight automobile chassis.

Graphene, which is composed of carbon, is plentiful and relatively cheap to produce, unlike the rare earth metals that currently power smartphones and tablets. It has been called the plastic of the 21st century because of its versatility, even touted as the heir apparent to silicon chips. From a materials standpoint, it does everything but wear a cape and rescue puppies.

So where's your jet pack? Since 2004, graphene has been stuck in the labs. Until recently, researchers have been able only to create microscopic flakes of the stuff, generating a mountain of patents and academic papers—and exactly zero product breakthroughs.

In recent years researchers figured out how to turn those flakes into sheets, a development that has encouraged the European Commission to make a €1 billion investment in developing the material. Analysts say the first graphene-intensive products should come to market within 18 months, with IBM (IBM), Samsung (005930), and Nokia (NOK) among those racing to be first.

The European Commission's grant will fund a decade of research and development by leading research institutions and big businesses, including Nokia, Airbus (EAD), Philips (PHG), and Repsol (REP). Most of the development work will be concentrated in labs and research and development plants in the U.K., Northern Europe, and Scandinavia.

There's a lot riding on graphene for austerity-stricken Europe. The PC, smartphone, and tablet booms have benefited the U.S. and Asia; Europe has noticeably lagged.

But ever since University of Manchester physicists Andre Geim and Konstantin Novoselov first isolated graphene in 2004, various European scientists and politicians have proudly claimed it as a victory for the continent. The trick now will be to turn the innovation into jobs.

"It would be disappointing if the fruits of European research were harvested elsewhere," says Jari Kinaret, one of Europe's leading graphene researchers, who was instrumental in lobbying the European Commission for the funding bonanza. "That is one of the key motivations for the graphene flagship project."

Nokia, too, is banking on a future of graphene-intensive products. Since 2009, the handset maker has committed R&D money to the development of flexible electronics made from graphene, says Jani Kivioja, research leader at Nokia Research Center in Cambridge, U.K.

Graphene's appeal lies in its concentrated strength, transparency, and conducting ability. A sheet one atom in thickness, for example, is all that's needed to construct the electrical circuitry of chips

or photovoltaic cells. In a lab or plant, ultra-thin sheets of graphene are cooked in an oven at about 900 degrees Celsius, a lower forging temperature than most varieties of steel require. Graphene can be mined or made in a lab, “but just about anything that contains carbon can be used to make graphene. Even chocolate has been used, just to show it can be done,” says Kinaret.

With funding in place, the European flagship research consortium will focus on developing flexible technologies, such as e-paper; this is of particular interest to Nokia and Philips. New types of solar panels and batteries made of graphene are also a priority, Kinaret says. “For batteries, you need an electrode with a large surface area, and graphene seems to be the ideal material for that. There, we see a lot of potential. These batteries would charge quickly. You can see how the owners of an electric car would like that.”

With the European Commission making such a high-profile investment, the pressure is on for Kinaret and the flagship’s 136 researchers to deliver a breakthrough. Nokia’s Kivioja understands the stakes are high: “This is the challenge we have in Europe. We have to commercialize the work being done in the labs.”