Enabling graphene-based technology via chemical functionalization

May 17 2009

Graphene is an atomically thin sheet of carbon that has attracted significant attention due to its potential use in high-performance electronics, sensors and alternative energy devices such as solar cells. While the physics of graphene has been thoroughly explored, chemical functionalization of graphene has proven to be elusive.

Now researchers at Northwestern University have identified conditions for chemically functionalizing graphene with the organic semiconductor perylene-3,4,9,10-tetracarboxylic-dianhydride (PTCDA).

PTCDA self-assembles into a molecularly pristine monolayer that is nearly defect-free as verified by ultra-high vacuum scanning tunneling microscopy. In addition, the PTCDA monolayers are stable at room temperature and atmospheric pressure, which suggest their use as a seeding layer for subsequent materials deposition.

Through chemical functionalization and materials integration, the outstanding electrical properties of graphene likely can be exploited in a diverse range of technologies including high-speed electronics, chemical and biological sensors and photovoltaics.

These results will be published online May 17 by *Nature Chemistry* and will be featured on the cover of the June 2009 issue of the journal.

"Graphene has captured the imagination of researchers worldwide due to its superlative and exotic electronic properties," said Mark Hersam, who

led the research team. He is professor of materials science and engineering in Northwestern's McCormick School of Engineering and Applied Science and professor of chemistry in the Weinberg College of Arts and Sciences.

"However, harnessing these properties requires the development of chemical functionalization strategies that will allow graphene to be seamlessly integrated with other materials that are commonly found in real-world technology," said Hersam. "The stability and uniformity of the chemistry demonstrated here suggest that it can be used as a platform for many device applications."

Source: Northwestern University (news : web)