

Using kaajal to make nano devices

December 07, 2005 09:57 IST

Indian women for ages have been using *kaajal* as eye liner without knowing that it is a product of high technology. Now scientists are talking about commercialising the process.

Scientists at the Indian Institute of Technology in Kanpur have shown that *kaajal* actually contains carbon nanotubes (CNTs). These objects, much thinner than the human hair, have strange properties and are considered the building block of ultra-small (nano) electronic and other devices.

While researchers worldwide are trying to develop newer and better methods for producing CNTs, the age-old practice of making *kaajal* is the simplest and the cheapest way of making them, the IIT scientists say.

Women in India [[Images](#)] prepare *kaajal* at home from the soot collected from lamp burning vegetable oil.

"Synthesis of *kaajal* is long known and its use is even mentioned in epics like the Ramayan and the Mahabharata [[Images](#)]," says Sabyasachi Sarkar [[Images](#)], chemistry professor at IIT.

He and his colleagues produced *kaajal* by burning mustard oil (soaked in cotton piece) and, using scanning electron microscope and other techniques, showed that the raw soot has an extensive network of CNTs.

The scientists went one step further and derived a water-soluble version of *kaajal* that showed magnetic properties "that has not been reported previously."

"The discovery of magnetic carbon (present in water soluble CNT) in aqueous solution may open the door for future application as carbon-based spintronics," the scientists said.

"Spintronics" is a new field that exploits the 'spin' of the electron (that gives rise to magnetisation) rather than its 'charge' to create a remarkable new generation of 'spintronic' devices which will be smaller and more versatile than those currently making up silicon chips and circuit elements.

The findings by Sarkar and co-workers -- Prashant Dubey, Devarajan Muthukumaran, Subhashis Dash and Rupa Mukhopadhyay -- have been reported in *Pramana*, "India's leading physics journal.

They believe that the beneficial effects of *kaajal* traditionally used for eye make-up might be 'due to the special structural property of the CNTs' present in *kaajal*.

Burning of other edible oils also produces soot, but mustard oil was selected because of its very high un-saturated fatty acids content and for its low cost, the scientists said.

© Copyright 2013 PTI. All rights reserved. Republication or redistribution of PTI content, including by framing or similar means, is expressly prohibited without the prior written consent.