

# CENTRAL Chronicle

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## Breakthrough in nanotechnology: Forget about heavy batteries

**BAGALORE:** It is a major step forward for nanotechnology-the science of manipulating individual molecules and atoms to build structures of complex atomic specifications.

An Indian scientist and his team at the Indian Institute of Science (IISc), Bangalore, have demonstrated that nanotubes- cylindrical carbon rolls no thicker than an atom - may make good batteries for tiny devices or even power pacemakers, thereby dispensing with cumbersome power packs.

Nanotechnology is a hot new science favoured by many tech companies in the post-silicon race to determine the shape of future microelectronics. Governments and companies around the world are investing heavily in nanotechnology, and many members of the scientific community are convinced that carbon nanotubes will enhance, if not completely replace, silicon transistors in the future.

In recent times, Bell Labs announced that it had created a new organic transistor with a channel length of a single molecule.

That transistor was made from carbon created by the chemical self-assembly of molecules. And last August, IBM announced the world's first logic circuit within a single nanotube. IBM is credited for developing "the highest-performing" carbon nanotube transistors to date.

Closer home, the Indian scientist, Ajay Sood and his colleagues demonstrated that a dense bundle of nanotubes, submersed in a slow-flowing liquid, develops a voltage that ranges up to 10 millivolts and increases with flow speed.

The tiny turbine "is made of single-wall carbon nanotubes. The generation of voltage by fluid flow nanotube is so small that a bundle the size of a sesame seed contains about 50 trillion tubes. As various fluids, from hydrochloric acid to water, flowed over a nanotube bundle mounted between metal electrodes, the IISc team measured the generated voltage.

Hydrochloric acid produces voltages about five times that of purified water and 60 times that of methanol, the team observed. Methanol and water are poorly ionized liquids, while hydrochloric acid contains abundant hydrogen ions.

Imbalances that develop between positive and negative charges as liquid flow over the tubes probably cause the voltage to develop. More ions create a greater charge difference and hence a greater voltage.

Scientists predict that charge-generating nanotubes may find applications in micro-machines that work in a fluid-and futuristic-environment. In the nearer future, nanotube turbines might power a new, lightweight line of heart pacemakers that need neither heavy battery packs nor recharging.

Meanwhile, at Bangalore, Sood and his team are confident that nanotubes will set the pace for many new technologies. The team is in the process of patenting the concept in both India and the United States.

**Sudhir Chowdhary (Source: Economic Times)**

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