

# Reaching out to the MASS

*Technology has always been developed for the benefit of human beings! They have not only simplified the processes but also have helped in doing things faster and easier as well as have been very cost effective. But bringing technology to the marketplace is a challenge! Though research labs are proclaiming to have earth-shattering technologies at hand, not many of them make it to the market. The factors for this are many, and it is a big story by itself. But let us look at the two companies, which have been incubated by academic institutes, who have developed products using nanotechnology that have direct impact on the lives of common people. Nano Digest thinks this trend is likely to be emulated more in years to come*





An average Indian could come and ask: Have you solved any of my problems? Take any IIT and ask, what problem did it solve? This question is the motivation for me to do something," says Prof T Pradeep of Indian Institute of Technology Madras.

On the other hand, we have Prof V Ramgopal Rao of Indian Institute of Technology Bombay who believes that technology is something that has to reach out to people and its benefits should be enjoyed by common man. "And this is the reason I have started working on the initiative to extend affordable equipment that helps in solving many critical issues."

These two teachers-cum-scientists from different IITs led groups of students and have helped them realise their dream of establishing companies. Prof Pradeep's team has formed InnoNano which looks into water purification while Prof Ramgopal Rao's team is developing sensors, MEMS and other electronic devices. The common thread is that both these companies are incubated by their academic institutes, and interestingly both of them are working in the area of nanotechnology.

Both the companies are presently housed in the institute campus and have already started commercial activities. The best part of these two companies is that they have developed products that are of use to everyone in the country! Be it water purifier or bomb detector, both of them are for the benefit of "average Indians".

### Water, Water, Everywhere ...

Water is the basic necessity for the survival of humans. Availability of safe drinking water is a major issue around the world. Major portion of people (over one billion) does not have access to potable water. Importantly vast majority of these people live in Africa and Asia. In India alone, waterborne diseases affect annually 37 million people mostly from rural areas and 1.5 million children are estimated to die of diarrhea.

The Water Aid report says, more than 40 per cent of aquatic resources in India are contaminated with coliform bacteria, on the other hand according to the BIS there should be no coliform present in drinking water. Although several governmental initiatives such as rural water supply programme are in practice, the problem is still significant due to lack of understanding among the major part of public about

the supply and safe storage of the water.

One of the major "killer" problems is that in some parts of the country the water is arsenic-contaminated. Arsenic poisoning causes several illnesses from skin diseases to cancer. It is reported that in West Bengal state alone six million people are chronically exposed to this kind of water. Having understood the problem after through research and field work, Prof Pradeep ventured on finding solution for this problem and this resulted in a product that is very commercially viable and it has led to the establishment of InnoNano company.

To put facts in order, Prof Pradeep has been working on water purification area for over a decade now. "I asked myself, while working on nanomaterials in 2002, if these particles could do anything to solve problems of everyday life," the multi-awarding scientist points out. This question led to development of nano-particle-based water filter which could remove pesticides. In fact it became the first such technology in the world to get commercialised. This was licensed to Eureka Forbes in 2004.

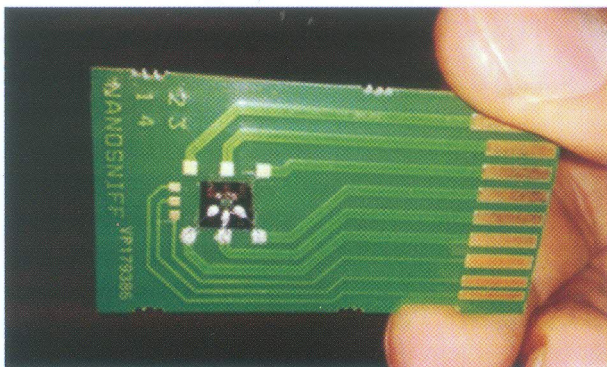
But the insatiable thirst for something more prompted Prof Pradeep and its team to look beyond this water filter. "We realised that there are contaminants other than pesticides like arsenic in the groundwater. It so happened that we produced several materials and one of them was good to handle arsenic," he pointed out.

The new water filter developed by Prof Pradeep is nanotechnology based and scavenges arsenic from the water. This makes possible of giving arsenic-free water at five paise per litre for any home. The nanotechnology-based water filtering unit is called

The InnoNano Team







AMRIT Arsenic and Metal Removal through Indian Technology. Interestingly the water-filters can be customised to filter out almost any contaminant lead, iron, or bacteria such as Ecoli just by having another filtering unit containing suitable nanoparticles.

After having seen the results this product in West Bengal state, this technology was been hived off into a separate company by Prof Pradeep and the baton of carrying forward the work has been bestowed upon Anshup, Uday Shankar and Amrita Chaudhary who have established InnoNano Research. The company is incubated by IITM. The company develops nanomaterials for the needs of places like Murshidabad and Nadia districts of West Bengal.

InnoNano Research is now manufacturing nanomaterial in large scale and for this it has set up a plant in Ambattur, outskirts of Chennai where they are able to churn out up to 40 kgs of nanomaterial everyday. Explaining about the journey from research in lab to manufacturing unit stage, Anshup, the co-founder of InnoNano Research, says, "The journey over the last six years has been very fascinating. The materials we have developed are

new, the properties which we have found are very new and the ways these materials have been applied are also new. We spent lot of time in developing these materials. Today we have around 20 Indian and international patents."

Interestingly, the state government of West Bengal has committed to setting up 2,000 of the arsenic-filtering units. The company is executing it in eight phases and this is the reason they have established a unit which will enable them to produce up to 40 kgs everyday. "Once it is fully ready, we can manufacture as much as 200 kgs of nanomaterial per day," claims Anshup.

### Enhancing Homeland Security

Prof Ramgopal Rao has been involved in the establishment of Centre for Excellence in Nanotechnology (CEN) at IIT Bombay and it has been not just creating a place of research an education, he and his team has made is haven for developing newer technologies that have direct impact on the lives of common man. And towards this end they have been working on building Micro Electro-Mechanical Systems (MEMS) and Nano Electro-Mechanical Systems (NEMS). Thanks to the breakthroughs that they achieved in this area, they found is a viable option to commercialise their products.

"With this thought in the mind, NanoSniff Technologies originated. This nanotechnology startup is incubated by IIT Bombay with the goal to commercialise MEMS and NEMS," explains Prof Ramgopal Rao, who along with Prof Soumyo Mukherji from IIT Bombay founded NanoSniff.



The NanoSniff Team





NanoSniff is the first of its kind startup which aims at building low cost MEMS solutions for homeland security and the fast growing nano-education sector in India. Explaining about the educational angle to entire project, Prof Ramgopal Rao, said, "CEN has pioneered the Indian Nano Users Program (INUP) to educate and train faculty, students and researchers from various Indian colleges in specialised skills required for handling the complex infrastructure required for fabricating nano structures. NanoSniff takes this initiative a step further by extending affordable equipment and facilities to the doorstep of colleges that run courses in electronics, sensor instrumentation and nanotechnology."

Prof Ramgopal Rao, leading nanotechnology scientist, and his team have dedicated to the establishment and development of NanoSniff and have been extensively working in developing various

products under the company. Talking about the organisation, Nehul Gullaiya says, "Set in the heart of IIT Bombay, NanoSniff has the skill and round the clock access to specialised equipment required for fabricating complex sensing structures called Micro-cantilevers which have been shown to be as sensitive as a sniffer dog for sniffing out concealed explosives. NanoSniff has already started commercialising the explosive detector technology and these products are expected to hit the market in a few months."

Apart from micro-cantilevers for sensors, NanoSniff as technology for fabrication of Micro-heaters capable of reaching temperatures as high as 600 Degree Celsius within microseconds. These Micro-heaters are used in inkjet printers as well as highly complex technologies such as micro-propulsion systems in space vehicles. What makes this special? We have heard of many companies able to come up with Micro-heaters technology for many applications. "The difference is that with the help of highly skilled team of Ph Ds, engineers and chemists, NanoSniff has brought down the cost of manufacturing these devices to a few hundred rupees making them very affordable for all applications" claims Nehul.

With reduced technology costs and the availability of highly sensitive devices, today researchers all over the world are exploring various applications these sensors and actuators can be used for. "To facilitate this research OmniCant, a Cantilever sensor based platform for bio-chemical detection, developed as lab instrument has already been commercialised and is being made available to colleges and universities across India at very affordable prices. Several instruments have already been setup in colleges offering students a chance to learn these technologies with an experimental outlook towards nanotechnology," observes Prof Ramgopal Rao.

NanoSniff also offers products around other MEMS devices such as Micro-heaters, Accelerometers and Inertial Navigation Sensors to enable students explore nanotechnology as well as to enable researchers develop products around these upcoming technologies.

These stories are not just success stories but are just small pointers as to how nanotechnology could turn into a mass technology helping our day-to-day life in all aspects, making lives simpler and more economical! Kudos nanotechnology!!

