

Gitanjali Rao

*Detection of Chemical Contaminants in Water Using Carbon Nanotube Sensors*

Millions of people around the world are exposed to water containing lead and its harmful side effects. Exposure to lead, especially in children, have lasting effects to development of brain, nervous system, and organs. It is estimated that over 5000 water systems and over 10 million service lines, in US alone, have lead contamination issues. The problem is compounded by the fact that accurate and actionable detection of lead in water today is a time consuming process. My solution addresses the core issue of speedy detection of lead contamination, potentially helping people take preventative measures and maybe even save lives! It uses the latest development in nanotechnology, is easy to use, fast, accurate, inexpensive and portable. It is a portable device, and uses nanotechnology materials to detect contaminants and almost immediately provides readout on mobile phones. Carbon nanotubes are strong conductors of electricity, due to their unique shape and structure. Any resistance in the structure causes measurable drop in the flow of current. My idea is to introduce, or dope, ions of elements that have strong affinity to lead, into the nanotube structure. When introduced to lead compounds in water, the resultant reaction with the sensor causes build-up of molecules, adding resistance to electron flow and drop in current. The change in current flow is measured and mapped to proportional parts per billion scale of lead contamination levels in water. To make the reading user friendly, I added a Bluetooth attachment to my Arduino, that sends the data to mobile phones. A custom app I developed takes the PPB scale, using EPA standards, show the safety levels of their water. Based on the timing and conclusion, I intend to enhance this for other chemical contaminants in water such as mercury, arsenic and cadmium.