# IN SEARCH OF NEW MATERIALS WITH EXCEPTIONAL PROPERTIES

Srinivasa Raghavan discusses with Chemical Today about his passion for inventing materials that can adapt to the environment and transform into something much better - to have a positive impact on the society.

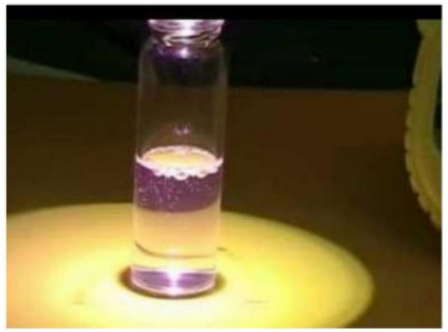
**Srinivasa Raghavan** is Professor and Patrick & Marguerite Sung Chair, Department of Chemical & Biomolecular Engineering, University of Maryland (College Park).

The aim of our team is to invent new materials with exceptional properties. Our focus is primarily on "soft" matter and "complex" fluids ie, those with a jelly-like or gooey or slimy consistency. These are very important materials because we are all examples of soft matter ie, we are made up of cells that have a gel-like interior. Also, we are surrounded by soft matters everywhere, including the foods we eat (jelly, ketchup) and the consumer products we use (toothpaste, shampoo) etc.

One particular direction of our research is the creation of responsive or "smart" systems. That is, we invent materials that adapt to their environment, such as changing from one shape to another in response to the external temperature. We invented materials that can change its viscosity. We have made a fluid that is 1000 times as viscous as honey, but when we shine ultraviolet light on it, the fluid's viscosity drops one million times and approaches that of water. When we shine visible light; the fluid viscosity can be returned to its original value. Another example is a container or capsule that can hold drugs. This can travel through our blood, but the moment it reaches a particular destination (eg, a cancer tumor), it will open up and release its contents.

The research that is most likely to have impact is our work on materials that stop bleeding. Bleeding is a critical issue for soldiers in the military as well as for civilians involved in serious accidents. We have discovered a low-cost polymer material that can arrest bleeding from the most severe and lethal injuries. This research has been featured by several television shows, including a British show called "Stephen Hawking's Brave New World."

We are generally motivated by fundamental scientific questions, like; can we create a material with a specific property? And if so,



how do we go about designing such a material? However because we are engineers, we also think about the practical aspects. For example, can we discover a very simple approach to make a given material? Can we use low-cost and widely available ingredients? Our focus on simplicity sets us apart from many other research groups in the same field.

We believe that fundamental science can still have a huge practical impact. For example, more than 20 patent applications based on our work have been filed with the U.S. Patent and Trademark Office (USPTO), with 12 patents already granted. Three startup companies have emerged out of our lab, and they are all being currently run by my former students.