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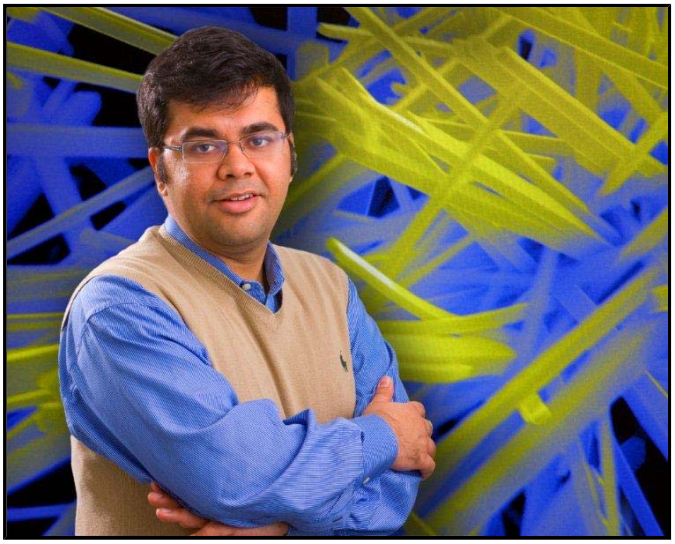
'Smart' windows in the works

By Christina Hernandez | Apr 12, 2011 | **7** Comments



Forget curtains and shades. Researchers from the **University at Buffalo** are working to develop "smart" windows to reflect the sun's rays during warm months and let in heat during the winter.

Sarbajit Banerjee, a chemist at the university, worked with students **Luisa Whittaker** and **Christopher Patridge** to develop chemical compounds for the window coating. I spoke last week with Banerjee. Here are excerpts of our interview:

What makes these "smart" windows?

It's the material we're making that goes on the windows. We have a really interesting material that essentially switches between two different phases. Phase transitions are ubiquitous in life. You think about the melting of ice. That's a phase transition from solid to liquid.

This is a different kind of phase transition because the material [we're developing] goes from one solid phase to another solid phase. It doesn't actually melt. It's accompanied by this huge change in properties. That's what makes it such an interesting window coating. It goes from something that lets in sunlight to something that completely blocks it. It's going to be almost an invisible change to the eye. It's not going to obscure your penthouse view, but it's going to block how much sunlight gets in on hot days.

How does this work?

There is a material people have known about for 50 years now. That is vanadium oxide. The problem with the material is it would only do the transition at 57 degrees Celsius, which is [almost] 150 degrees Fahrenheit. We found out you can make the material small, nano-scale. By doing this, we can control the temperature at which it switches over.

What phase is the work in now?

We started to work with the **National Renewable Energy Lab** to look at these materials as window coating. We've been able to establish and validate the basic science. We've also done a lot of experiments to understand the fundamental mechanism of how this happens.

The material has been known for 50 years, but we recently added a couple of new materials that are able to do similar things. We're pretty excited about those. There's enough basic science to set the stage for us to do the engineering and actually make windows out of it.

What challenges do you face in order to get this working?

The challenges are engineering. We made these materials on a lab scale, so we're going to have to think about scaling these up to much larger quantities. We have to figure out ways to make much larger amounts of these materials, while controlling their composition.

How long until these could be used?

I'd say within five years. The materials are relatively naturally abundant. They're not too expensive. There are not a huge amount of obstacles to this. There are some companies that are already interested in this type of smart window application. We're open to commercial partners.

Is there anything else you'd like to add?

Windows are low-hanging fruits for materials like this. What this material needs to do in a window is not so demanding. We are also envisioning applications of these materials eventually in some high-tech computer circuitry. You could switch back and forth between the two states. That could be another way of storing memory or doing fast computing.

Watch a video about the findings.

Photo: Sarbajit Banerjee

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