New nano-material research a 'pore' excuse for engineering

March 21 2006

A new study by chemists and engineers at the University of Toronto describes a nanoscale material they've created that could help satisfy society's never-ending hunger for smaller digital devices and cellphones, and could even lead to new methods for delivering medications via skin patches.

The material, known as periodic mesoporous organosilica (PMO), is a thin film interspersed with pores just two-billionths of a metre across. The team created it by mixing an organosilica precursor (silica glass, containing organic groups) with a surfactant -- essentially, a soap that mixes oil and water -- which causes the organosilica to self-assemble into a nanostructure. The scientists then washed away the surfactant to leave a nanoporous material. When they examined the thin film that remained, they discovered that it made an excellent insulator that could be used to separate tiny wires inside microelectronics.

The study appears on the cover of the March issue of *Materials Today*.

"It demonstrates how creative chemistry can lead to really interesting engineering -- it's a good marriage," says Benjamin Hatton, who led the work while he was a PhD candidate working with both the Departments of Chemistry, with supervisor Professor Geoffrey Ozin, and Materials Science and Engineering, with supervisor Professor Doug Perovic. "Technology can develop in unexpected ways, and what we've found here could lead to developments in microelectronics or drug delivery systems."

Conventionally, computer chip manufacturers have insulated their wire connections with silica glass, preventing them from coming into contact and interfering, with each other. But the PMO film described in this study acts as a better insulator and would take up far less room, allowing components to shrink even further. "Industry is always looking for a better insulator," Hatton says. "This is an example of how materials chemistry can provide innovative solutions to the design of novel materials."

Source: University of Toronto