Highlight: Exploiting strain fields

December 10 2009

(PhysOrg.com) -- Electronic devices of the future may benefit from a fundamental discovery that allows researchers to customize the electronic properties of complex materials such as single-crystal thin-film structures.

In a letter published in *Nature Physics*, lead author Thomas "Zac" Ward of Oak Ridge National Laboratory describes how electronic phase separation can be controlled through strain fields in a material. A strain field is one in which the material is stretched more in one direction than another.

"By doing this, we can force metallic regions to spontaneously form along the direction of stretching," Ward said. "This means that along the stretched direction the resistance is low while along the unstretched direction the resistance is very high."

Ward and co-authors John Budai, Zheng Gai, Jonathan Tischler, Lifeng Yin and Jian Shen cite differences in resistivity in some cases reaching 20,000 percent.

"Practically, this discovery means that we are closer to controlling complex electronic correlations that could one day revolutionize the electronics industry in the form of new multi-functional, lower energy-consuming devices," Ward said. This research was funded by the Department of Energy's Office of Basic Energy Sciences.

More information: Elastically driven anisotropic percolation in

electronic phase-separated manganites, *Nature Physics* 5, 885 - 888 (2009), doi:10.1038/nphys1419