Physicists Unlock Mysteries of the DVD-RAM

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DVD technology is by no means new, but that doesn't mean that we know everything about the way that these devices store our movies and data. New research conducted by scientists at North Carolina State University has provided new insight into how this mature technology works. Their findings may lead to advances in data storage as well as within the computer industry as a whole.

Dave Baker, a doctoral candidate in physics in NC State's College of Physical and Mathematical Sciences, worked with Drs. Michael Paesler and Gerald Lucovsky from NC State as well as with colleagues from the Colorado School of Mines and the Indian Institute of Technology to discover how DVD-RAMs work on the microscopic level. Their findings appear in the July 7 edition of *Physical Review Letters*.

DVD-RAMs, or read/writable DVDs, are composed of an alloy that contains three elements: germanium (Ge), antimony (Sb) and tellurium (Te). This alloy is commonly used in data storage technologies due to its ability to change phases from a crystalline to a non-crystalline state. The phase changes are what allow the DVD-RAM to take and hold data. While scientists were familiar with the basic properties of the alloy, they didn't know how it worked on a microscopic level: why one particular ratio of elements worked better than others.

Baker and his team used a tool called EXAFS to examine the alloy on the microscopic level. EXAFS, or extended x-ray absorption fine structure, is a type of x-ray spectroscopy that allows scientists to determine specifically which atoms are present in a particular material, and where they are located in relation to each other. By then applying bond constraint theory to the data, the researchers were able to calculate the optimum ratio of elements within the material.

“With EXAFS, you have the ability to look at the position of atoms within the material both before and after a switch from the crystalline to the non-crystalline state,” Baker said. “It shows you exactly how the mechanism works to get the material from one state to the other.”

The practical result of the information is that scientists will be able to “fine tune” the alloy, which could lead to the development of not only more efficient data storage devices but also remotely reconfigurable electronics - for example, computers that could be sent into orbit and then reprogrammed as needed without the cost of sending up another spacecraft or satellite.

“Our work deepens the understanding of these materials,” Baker says, “and that will in turn allow us to create more efficient materials that will be useful in a number of applications.”

Source: North Carolina State University

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