

Hybrid computer materials may lead to faster, cheaper technology

April 3 2008

A modern computer contains two different types of components: magnetic components, which perform memory functions, and semiconductor components, which perform logic operations. A University of Missouri researcher, as part of a multi-university research team, is working to combine these two functions in a single hybrid material.

This new material would allow seamless integration of memory and logical functions and is expected to permit the design of devices that operate at much higher speeds and use considerably less power than current electronic devices.

Giovanni Vignale, MU physics professor in the College of Arts and Science and expert in condensed matter physics, says the primary goal of the research team, funded by a \$6.5 million grant from the Department of Defense, is to explore new ways to integrate magnetism and magnetic materials with emerging electronic materials such as organic semiconductors.

The research may lead to considerably more compact and energy-efficient devices. The processing costs for these hybrid materials are projected to be much less than those of traditional semiconductor chips, resulting in devices that should be less expensive to produce.

“In this approach, the coupling between magnetic and non-magnetic components would occur via a magnetic field or flow of electron spin,

which is the fundamental property of an electron and is responsible for most magnetic phenomena,” Vignale said. “The hybrid devices that we target would allow seamless integration of memory and logical function, high-speed optical communication and switching, and new sensor capabilities.”

Vignale studies processes by which magnetic information can be transferred from a place to another.

“One of the main theoretical tools I will be using for this project is the time-dependent, spin-current density functional theory,” Vignale said. “It is a theory to which I have made many contributions over the years. The results of these theoretical calculations will be useful both to understand and to guide the experimental work of other team members.”

Source: University of Missouri-Columbia

Citation: Hybrid computer materials may lead to faster, cheaper technology (2008, April 3) retrieved 14 August 2024 from <https://phys.org/news/2008-04-hybrid-materials-faster-cheaper-technology.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.