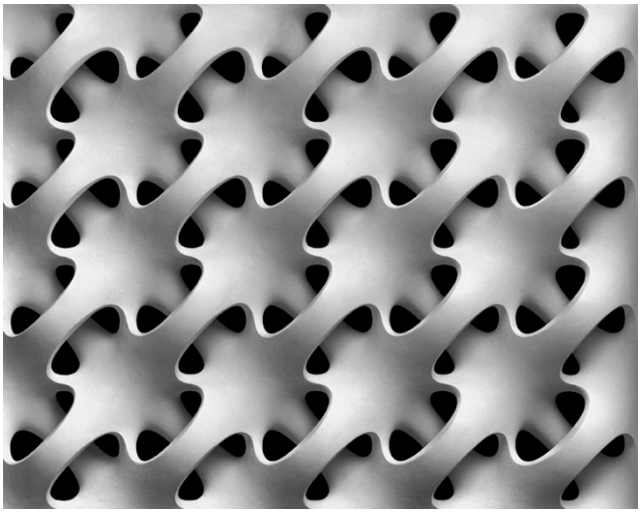
ReD: A Responsive Daylighting Panel Integrating Phase Change Material



Hauer, Erwin, http://www.erwinhauer.com/ (3 March 2008)

Impact: With energy prices constantly increasing and affecting economic conditions around the world, there is an increasing need for sustainable solutions to energy consumption. Energy use reduction can be accomplished by reducing the heat generated from sources of artificial light. Reducing this load can help minimize a building's operating costs, and provide a sustainable alternative to conventional window systems.

ReD is a responsive daylighting panel with phase change material embedded in a conductive and lightweight composite, which has the potential to illuminate interior building environments with ample sunlight without increasing the building's reliance on mechanical systems for heating and cooling. ReD will use a renewable energy source in the form of solar energy, thus diminishing the need for costly heating and cooling systems. Thermal comfort and quality of illumination will also be improved with the use of daylight.

Project Overview: The project team will design, build, and test a Responsive Daylighting Panel (ReD) prototype. In an age of growing environmental awareness, the benefits of daylight are in high demand, but there must be a way to include it without sacrificing thermal performance. In ReD, the embedded phase change material shifts from clear transparent to translucent white, allowing for daylight to pass through without heat gain. Consequently, the panel will have heat storage capacity similar to masonry construction, but within a thin modular building system. Large-scale commercial applications, such as office buildings, museums, and institutions, would benefit the most from this technology. This project will conduct experiments on the ReD technology and design prototypes. Based on preliminary research, the team anticipates that ReD will reduce heat losses by 30% and reduce solar heat gains by 50%; as compared to double-glazed window assemblies.

GBA Product Innovation Grant Amount: $20,000

Leadership Team: The Project team includes Temple University Architecture Professors Sneha Patel and Rashida Ng, who have expertise in the areas of material technologies, advanced fabrication, and sustainable building performance; the team also **includes** Villanova University Mechanical Engineering Professor Amy Fleischer, who has expertise in thermal management systems utilizing phase change material. Dr. Jon Zuo, founder of Advanced Cooling Technologies (ACT), is also affiliated with the project; ACT is a Lancaster-based company that specializes in advanced thermal technology development and custom product manufacturing.

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