

# New ORNL-GE Appliances project aims to revolutionize residential refrigerators

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ORNL's Ayyoud Momen works on the team's "breadboard" prototype refrigerator-freezer: a flexible platform used to evaluate material compatibility and to analyze components including the magnet, generators, motor, pump, heat exchangers, plumbing and leakless rotating valve.

Not much has changed in refrigeration technology in the past 100 years,

until now. Researchers with Oak Ridge National Laboratory's Building Technologies Program have partnered with General Electric (GE) Appliances through a cooperative research and development agreement (CRADA) to revolutionize home refrigerators using magnetocaloric cooling.

GE's research team is working to apply the concept of the magnetocaloric effect (MCE) to residential refrigerators, replacing conventional vapor compression technology while still reaching the desired cooling temperatures. Instead of traditional refrigerants, the system uses solid refrigerants and water-based fluids, which are more environmentally friendly and cost less.

The MCE approach relies on magnets instead of a compressor to create a magnetic field that agitates particles in the solid refrigerant, causing it to cool. The strength of the magnetic fields determines how cold the solid refrigerant becomes and, in turn, how quickly it cools the refrigerator.

"It's the equivalent to a gas-powered car moving to electric—that's the kind of leap we're making in refrigeration," said Ed Vineyard, Building Equipment Research Group leader with the Building Technologies Research and Integration Center at ORNL. The center is a Department of Energy user facility aimed at developing energy-efficient building system technologies in partnership with private industry.

Use of MCE requires changes to the mechanisms through which the refrigerant flows. For instance, ORNL researchers Ayyoub Momen, Omar Abdelaziz and Vineyard are working to determine the new requirements for refrigeration circuit seals and hydraulics.

The ORNL team is also building a "breadboard" prototype refrigerator-freezer: a flexible platform used to evaluate material compatibility and to analyze components including the magnet, generators, motor, pump,

heat exchangers, plumbing and leakless rotating valve.

ORNL's early results in employing MCE for both residential and commercial refrigeration indicate the MCE technology is a promising alternative to the vapor compression systems used in today's appliances, one that could theoretically reduce energy consumption by 25 percent. The researchers will continue to develop the new design, which is expected to cost a little more than current refrigeration technologies but save consumers money in the long term by reducing energy bills.

In March, Vineyard participated in a Google Hangout hosted by GE at Appliance Park in Louisville, Kentucky, to educate the public about GE's intent to commercialize magnetocaloric [refrigerators](#) for use in homes by 2020. A video of the Hangout can be viewed at [www.youtube.com/watch?v=uDF\\_COU1OJI](http://www.youtube.com/watch?v=uDF_COU1OJI).

According to GE, the MCE technology can be applied to other heat pump applications, such as heating, ventilation, and air conditioning (HVAC), and has the potential to impact nearly 60 percent of the average U.S. household's energy consumption.

Provided by Oak Ridge National Laboratory

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