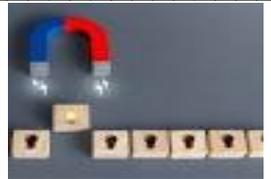




The Journal



Researchers boost viability of magnetic refrigeration



The Equestrian Manor progressing at WEC opened to the public in Ocala FL



Ocala FL, Feb 1, 2026 A new, 180,000-square-foot event venue that was under construction at the World Equestrian Center in Ocala is taking form with its opening scheduled for the coming months.

The Equestrian Manor is currently under construction at the World Equestrian Center (WEC), which is located at 1750 NW 80th Ave in Ocala.

Since construction began, WEC has regularly provided updates in the form of aerial photos showing the venue. Although the specific date hasn't been announced, WEC's website has consistently shown the project debuting this fall.

The Equestrian Manor will host conferences, weddings, and other events and will feature state-of-the-art, grand and junior ballrooms, meeting rooms, pre-function space a dedicated bridal suite, banquet space, covered balconies, an expansive outdoor event lawn, a pavilion, and globally inspired dining, according to WEC.



Earlier this year, the organization announced that The Equestrian Manor will feature the following three restaurants: The Polo Pony (American), Genievue's (Italian), and The White Willow (Asian). Two of the businesses will feature rooftop dining.

The Equestrian Manor, which has four different eateries and several other state-of-the-art amenities. Credit: World Equestrian Center In addition to the three restaurants, the venue will also have a second Emma's Patisserie location.

OscarTek custom finish cases as an integral part of the design

Researchers boost viability of magnetic refrigeration

February 9, 2026

GERMANY: Researchers from Germany and Japan claim to have unlocked a way to enhance the performance of magnetocaloric refrigeration and improve the material's durability.

The magnetocaloric effect, a phenomenon where certain materials change temperature when exposed to a magnetic field, could potentially pave the way for a more sustainable alternative to vapour compression technology.

Until now, researchers have faced a fundamental dilemma: materials with a high cooling effect often suffered from irreversible energy losses, an effect known as hysteresis, which led to rapid degradation in cooling effect under operating conditions. Conversely, the conventional durable materials failed to achieve the large cooling effect required for practical application.

The research team made up of representatives from Germany's Technical University of Darmstadt and the National Institute for Materials Science (NIMS) in Japan, along with other prestigious institutes, claimed to have achieved a decisive breakthrough using a novel approach to material design.

By fine-tuning atomic bonding (covalent bonding) through precise control of the chemical composition, they were able to minimize irreversible energy losses. The study focused on a compound of gadolinium (Gd) and germanium (Ge). This magnetic cooling material, Gd_5Ge_4 , heats up when an external magnetic field makes the atoms' tiny magnetic "spins" line up.

The researchers identified that the performance degradation of this material is caused by a structural transition that occurs during magnetic transitions. In Gd_5Ge_4 , changing bond lengths between germanium atoms, which connect the structural slabs, contribute to hysteresis and performance degradation during repeated cycling.

To solve this, the team replaced a portion of the germanium with tin (Sn) atoms to precisely tune the material's covalent bonding. As a result of these changes, the material is said to maintain its cooling over repeated cycles while simultaneously more than doubling its reversible adiabatic temperature change, which rose from 3.8°C to 8°C . This breakthrough enhances both the magnetocaloric effect and the material's overall durability, paving a sustainable, high-performance path for magnetic refrigerants. Because these materials operate efficiently at cryogenic temperatures, ranging from approximately -233°C to -113°C , they are seen as an ideal choice for gas liquefaction.

The consortium now plans to apply this methodology to a broader range of compounds, expanding the technology's reach across various cooling and gas liquefaction sectors. From a fundamental perspective, this research sheds light on the crucial interplay between electronic bonding, crystal structure, and magnetic order in determining magnetocaloric properties. By controlling covalent bonding networks, the energy barrier associated with the structural phase transition can be tuned, effectively minimizing irreversibility. This concept challenges conventional wisdom which often viewed magnetic and structural transitions as inseparable and difficult to decouple, offering a new paradigm for materials design across related fields such as spintronics and solid-state cooling technologies.

The implications of this research extend beyond room-temperature cooling applications. Given that the developed magnetocaloric materials operate effectively at cryogenic temperatures, they are highly promising candidates for next-generation hydrogen liquefaction technologies. The need for low-environmental-impact liquefaction methods is rapidly increasing alongside global efforts to adopt hydrogen as a clean energy carrier. The ability of this material system to deliver large cooling effects reliably under cyclic operation could significantly improve energy efficiency in hydrogen liquefiers, reducing carbon footprints associated with fuel production and storage. The other contributors to this international research included the Kyoto Institute of Technology (KIT) in Japan, the Japan Synchrotron Radiation Research Institute (JASRI), and the University of Hyogo and Tohoku University in Japan.

