



Joint News Release

## **Premiere of cutting-edge cooling appliance at CES 2015**

- Haier, Astronautics, and BASF present the first prototype of a magnetocaloric wine cooler at the International Consumer Electronics Show in Las Vegas/Nevada
- Partners demonstrate the functional principle of innovative technology for energy efficient cooling

**Ludwigshafen, Germany and Las Vegas, Nevada, January 6, 2015.** Haier, a leading global manufacturer of household appliances, Astronautics Corporation of America, a global technology company, and BASF, the world's leading chemical company, present at the International Consumer Electronics Show (CES, Jan. 6 - 9) in Las Vegas, Nevada, a proof-of-concept wine cooler refrigerated by a magnetocaloric heat pump.

A magnetocaloric heat pump – a cooling device based on magnetocaloric materials – is an ideal alternative to traditional compressor-based refrigeration technology. Magnetocaloric materials heat up when put in a magnetic field and cool down when removed from the magnetic field. In the magnetocaloric heat pump, heat is transferred from the cold interior of the wine cooler to the warm surrounding air by shuttling a water-based coolant through the magnetocaloric materials as they go in and out of the magnetic field.

One key to success is a class of functional materials based on manganese and iron developed by BASF and its partner Delft University of Technology, the Netherlands. "Together with our research colleagues who are well-experienced in functional materials as well as in systems solutions and modelling, we developed this innovative class of materials," explains Andreas Riehemann, Managing Director of BASF New Business GmbH. "Together with our partners we can develop tailor-made functional materials for our customers' cooling applications." The magnetocaloric materials consist of abundant and affordable raw materials. They feature high performance across the whole range of temperatures relevant to refrigeration as well as high

volume stability under operating conditions. BASF will sell these materials under the Quice® brand.

Astronautics provided the specialized expertise to integrate the new materials into the magnetocaloric heat pump. “By operating an integrated wine cooler prototype we demonstrate that magnetocaloric technology has the potential to revolutionize the cooling industry,” says Dr. Steven L. Russek, Director of the Astronautics Technology Center in Madison, Wisconsin. Using BASF’s magnetocaloric materials, Astronautics developed the magnetocaloric heat pump and along with Haier integrated it into the prototype wine cooler. Theoretical studies demonstrate that refrigeration systems based on the magnetocaloric effect can be up to 35% more energy-efficient than vapor compression systems. Furthermore, cooling systems based on magnetocaloric materials will operate with less noise due to the absence of a compressor. This technology makes use of water-based coolants instead of gaseous refrigerants.

Haier contributed their knowledge of household appliances and led the prototype development of the wine cooler which is now equipped with the magnetocaloric heat pump. “The investment in the world’s first magnetocaloric wine cooler symbolizes Haier’s determination to be truly customer-focused and forward-thinking,” says Dr. Tao Xie, Director of Disruptive Technology of the Haier America Tech Center in Evansville, Indiana. “We are constantly challenging ourselves for disruptive ways to deliver new user experiences and be socially responsible for the community and the environment. The magnetocaloric wine cooler prototype shows great promise to help our customers save energy, cut utility bills, and reduce operating noise. As an environmentally friendly technology that produces zero ozone depleting gases or greenhouse gases, it is a technology Haier is aggressively pursuing.” Haier plans to introduce the technology into the market within the next couple of years providing a compressor free cooling alternative. The partners plan to continue their cooperation to achieve this goal.

To learn more about the functional principle please go to:

[Prototype movie on YouTube](#)

## About BASF

At BASF, we create chemistry – and have been doing so for 150 years. Our portfolio ranges from chemicals, plastics, performance products and crop protection products to oil and gas. As the world's leading chemical company, we combine economic success with environmental protection and social responsibility. Through science and innovation, we enable our customers in nearly every industry to meet the current and future needs of society. Our products and solutions contribute to conserving resources, ensuring nutrition and improving quality of life. We have summed up this contribution in our corporate purpose: We create chemistry for a sustainable future. BASF had sales of about €74 billion in 2013 and over 112,000 employees as of the end of the year. BASF shares are traded on the stock exchanges in Frankfurt (BAS), London (BFA) and Zurich (AN). Further information on BASF is available on the Internet at [www.basf.com](http://www.basf.com).

## About Astronautics Corporation of America

Astronautics Corporation of America, which celebrated its 50th anniversary in 2009, is a mid-sized privately held corporation headquartered in Milwaukee Wisconsin. Astronautics and its subsidiaries are suppliers of high-reliability avionics, guidance, and navigation equipment to commercial aircraft manufacturers (including Boeing and Airbus) as well as to U.S. and foreign governments. Astronautics is a world leader in the development of magnetic refrigeration technology. In 2001, Astronautics unveiled the world's first permanent-magnet based magnetocaloric heat pump (magnetic refrigerator). The availability of giant magnetocaloric materials along with Astronautics' advanced modeling and thermo-mechanical systems design capabilities has enabled a focus on appliance, air conditioning, commercial refrigeration and other cooling applications.

## About Haier

Founded in 1984, Haier, a global company world headquartered in Qingdao, China, through its entrepreneurial and innovative spirit, has transformed itself from a small factory into the world's #1 major appliance brand as ranked by Euromonitor International 2013, and a global leader in consumer electronics. Haier employs more than 70,000 people worldwide and distributes products in more than 100 countries and regions with global revenues reaching \$29.5 billion in 2013. On the 2012 World's 50 Most Innovative Companies list published by the Boston Consulting Group, Haier was the only Chinese company in the top 10, as well as the top-ranked consumer product retailer.

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