KNOW-HOW

July 2017

Caloric Systems: Solid State based cooling and heating

- **Back-up II Source: Fraunhofer IPM contact: Dr. Kilian Bartholomé**

Magnetocalorics

It is possible to develop particularly energy-efficient cooling systems that operate on the basis of the magnetocaloric effect – entirely without harmful refrigerants. They are based on so called magneto-caloric (MC) materials. MC materials are magnetizable materials which heat up when exposed to a magnetic field and cool down again accordingly when the field is removed. This is how it is possible to implement a cooling cycle: The heated MC material is connected to a heat sink so that heat can be dissipated. If the magnetic field is removed, the material cools down again and is at a lower temperature than at the start of the cycle. The MC material is now connected to the system to be cooled and is able to absorb heat. Magnetocaloric cooling systems achieve up to 30 percent higher efficiencies by comparison with compressor-based systems.

Electrocalorics

The principle of electrocaloric cooling is similar to that of magnetocaloric cooling: A reversible heatflow is produced in the electrocaloric material when exposing it to an electric field. With intelligent system integration, this effect can be used to establish efficient cooling systems without harmful refrigerants.

Elastocalorics

Elastocaloric materials are already known in other applications as »shape memory alloys«. In these alloys, the material changes shape when heat is applied. By applying force to the material to generate reversible heat, the opposite effect can also be used. Just as with magnetocaloric or electrocaloric materials, this method can be integrated into a system to create a cooling system.

Ideelle Träger
Honorary Sponsors
Air conditioning and Refrigeration European Association (AREA) Brussels, Rixensart, Belgium

Association of European Refrigeration Component Manufacturers (ASERCOM), Brussels, Belgium

Bundesfachschule Kälte-Klima-Technik, Maintal/Niedersachswerfen

Bundesinnungsverband des Deutschen Kälteanlagenbauerhandwerks (BIV), Bonn

Bundesverband WärmePumpe e. V. (BWP), Berlin

Deutscher Kälte- und Klimatechnischer Verein e. V. (DKV), Hannover

EPEE European Partnership for Energy and Environment, Brussels, Belgium

eurammon, Frankfurt

Exhibitors Group/Ausstellerkreis Chillventa Nürnberg

Fachverband Allgemeine Lufttechnik im VDMA, Frankfurt

Fachverband Gebäude-Klima e. V. (FGK), Bietigheim-Bissingen

Institut für Luft- und Kältetechnik (ILK), Dresden

Test- und Weiterbildungszentrum Wärmepumpen und Kältetechnik (TWK), Karlsruhe

TÜV SÜD Industrie Service Center of Competence für Kälte- und Klimatechnik, München

Verband Deutscher Kälte-Klima-Fachbetriebe e. V. (VDKF), Bonn

Zentralverband Kälte Klima Wärmepumpen e. V. (ZVKKW), Bonn

Veranstalter
Organizer
NürnbergMesse GmbH
Messezentrum
90471 Nürnberg
Germany
T +49 9 11 86 06-0
F +49 9 11 86 06-82 28
chillventa@nuernbergmesse.de
www.chillventa.de

Vorsitzender des Aufsichtsrates
Chairman of the Supervisory Board
Dr. Ulrich Maly
Oberbürgermeister der Stadt Nürnberg
Lord Mayor of the City of Nuremberg

Geschäftsführer
CEOs
Dr. Roland Fleck, Peter Ottmann

Registergericht
Registration Number
HRB 761 Nürnberg

NÜRNBERG MESSE

Principle of magnetocaloric cooling

The magnetocaloric (MC) material is heated (step 1) by applying a magnetic field (H field). In step 2, the MC material is connected to a heat sink so that the heat produced (Q) can be dissipated. If the magnetic field is removed (step 3), the MC material cools down again and is at a lower temperature than it is at the start of the cycle. The MC material is now connected to the system to be cooled and can absorb heat (Q) (step 4).
Please check the graphic in the download area.

Press and Media Contact

Bertold Brackemeier, Ariana Brandl
T +49 9 11. 86 06-82 85
F +49 9 11. 86 06-12 82 85
ariana.brandl@nuernbergmesse.de

You can find all press materials and additional information and photos at:
www.chillventa.de/press