Magnetocaloric effect - physics and applications

H. Szymczak and R. Szymczak

Institute of Physics, Polish Academy of Sciences, Lotników 32/46, 02-668 Warsaw, Poland

Recently, there has been a significant increase in research on a more than 100-year old phenomenon — the magnetocaloric effect. The development of a new magnetic refrigeration technology, based upon this effect, has brought an alternative to the conventional gas compression technique. As a result, many new materials with large magnetocaloric effect have been discovered, and a much better understanding of this magneto-thermal property has resulted. The magnetic refrigeration has several advantages compared with conventional techniques. First of all, the cooling efficiency in magnetic refrigerators is very high and there are no harmful gas involved. They may be built more compactly and generate much less noise.

In this review we will briefly discuss the principles of magnetic cooling (and heating) and the magnetocaloric properties of the *4f* lanthanide metals, their intra-lanthanide alloys and their compounds , the *3d* transition metals, their alloys and compounds; and mixed lanthanide-*3d* transition metal materials (with special focus on manganites). The possibility of use these materials in magnetic refrigerators working near room temperature will be discussed.

Name of the presenting author (invited): Henryk Szymczak
e-mail address: szymh@ifpan.edu.pl
http://www.ifpan.edu.pl