



How does heat affect magnets?

Magnetic materials should maintain a balance between temperature and magnetic domains (the atoms' inclination to spin in a certain direction). When exposed to extreme temperatures, however, this balance is destabilised; magnetic properties are then affected. While cold strengthens magnets, heat can result in the loss of magnetic properties. In other words, too much heat can completely ruin a magnet.

How it works. Excessive heat causes atoms to move more rapidly, disturbing the magnetic domains. As the atoms are sped up, the percentage of magnetic domains spinning in the same direction decreases. This lack of cohesion weakens the magnetic force and eventually demagnetises it entirely. In contrast, when a magnet is exposed to extreme cold, the atoms slow down so the magnetic domains are aligned and, in turn, strengthened.

Ferromagnetism. The way in which specific materials form permanent magnets, or interact strongly with magnets. Most everyday magnets are a product of ferromagnetism.

Paramagnetism. A type of magnetism that occurs only in the presence of an external magnetic field. They are attracted to magnetic fields, but they are not magnetised when the external field is removed. This is because the atoms spin in random directions; the spins aren't aligned, and the total magnetisation is zero. Aluminium and oxygen are two examples of materials that are paramagnetic at room temperature.

Curie Temperature. Named after the French physicist Pierre Curie, the Curie temperature is the temperature at which no magnetic domain can exist because the atoms are too frantic to maintain aligned spins. At this temperature, the ferromagnetic material becomes paramagnetic. Even if the magnet is cooled, once it has become demagnetised, it will not become magnetised again. Different magnetic materials have different Curie temperatures, but the average is between 600-800 degrees Celsius.

(Taken from http://www.ehow.com/how-does_4926450_heat-affect-magnets.html)

EXERCISES

1 True or false?

- a. High temperatures strengthen magnets. T F
- b. Extreme cold makes the atoms of a magnet slow down. T F
- c. All materials have the same Curie temperature. T F
- d. Once a magnet is ruined by high temperatures, it can never get its magnetism back. T F

2 Find mistakes and correct.

- a. Cold can make a magnetic material lose its magnetic properties.
- b. Excessive heat causes atoms to move more slowly.
- c. Almost all everyday magnets are a product of paramagnetism.
- d. Paramagnetism occurs only in the presence of an internal magnetic field.
- e. Aluminium and oxygen are paramagnetic at high temperatures.
- f. At room temperature a ferromagnetic material becomes paramagnetic.
- g. The average Curie temperature is between 600-800 degrees Fahrenheit.

3 Match questions and answers.

QUESTIONS		ANSWERS	
A	What is the Curie temperature?	1	The mechanism through which some materials form permanent magnets, or are attracted by other magnets, is called ferromagnetism.
B	What is ferromagnetism?	2	When a magnetic material is exposed to low temperatures, its atoms slow down and, as a consequence, its magnetic domain is strengthened.
C	What happens to a magnetic material if it is exposed to low temperatures?	3	It is the temperature at which the magnetic domain of a material is permanently ruined and ceases to exist; it is different for different materials.

A	B	C
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