

4. Elastocaloric Effect

Prelims: Science & Technology

Mains: GS-III- Science and Technology- developments and their applications and effects in everyday life.

Why in News?

- ▶▶ When rubbers bands are twisted and untwisted, it produces a cooling effect.
- ▶▶ This is called the “elastocaloric” effect, and researchers have suggested that it can be used in a very relevant context today.
- ▶▶ Researchers have found that the elastocaloric effect, if harnessed, may be able to do away with the need of fluid refrigerants used in fridges and air-conditioners.
- ▶▶ These fluids are susceptible to leakages, and can contribute to global warming.

How it works?

- ▶▶ In the elastocaloric effect, the transfer of heat works much the same way as when fluid refrigerants are compressed and expanded.
- ▶▶ When a rubber band is stretched, it absorbs heat from its environment, and when it is released, it gradually cools down.
- ▶▶ In order to figure out how the twisting mechanism might be able to enable a fridge, the researchers compared the cooling power of rubber fibres, nylon and polyethylene fishing lines and nickel-titanium wires.
- ▶▶ They observed high cooling from twist changes in twisted, coiled and supercoiled fibres.

Efficiency:

- ▶▶ The level of efficiency of the heat exchange in rubber bands “is comparable to that of standard refrigerants and twice as high as stretching the same materials without twisting”.
- ▶▶ To demonstrate this setup, the researchers developed a fridge the size of a ballpoint pen cartridge that was able to bring down the temperature of a small volume of water by 8°C in a few seconds.
- ▶▶ They suggested that their findings may lead to the development of greener, higher-efficiency and low-cost cooling technology.