

IRON ION BATTERY

Prelims: Science & Technology

Mains: GS-III- Science & Technology- Awareness in the fields of IT, Space, Computers, robotics, nano-technology, bio-technology and issues relating to intellectual property rights.

Why in News?

- ▶▶ For the first time, Indian Institute of Technology (IIT) Madras has fabricated a rechargeable iron ion battery using mild steel as the anode.

Highlights:

- ▶▶ With no lithium reserves in India and shortage of lithium reserves in the world, the stress is on developing rechargeable batteries of comparable performance using materials other than lithium. Iron has favourable physico-chemical properties like lithium.
- ▶▶ The redox potential of iron ion is higher than lithium ion and the radius of the Fe^{2+} ion is nearly the same as that of the lithium ion

Features:

- ▶▶ While lithium ions are the charge carriers in lithium ion battery, the Fe^{2+} ions perform that function in the case of iron ion battery.
- ▶▶ The performance of an iron ion battery can go up to 150 cycles of charging and discharging. In the iron ion battery, Vanadium Pentoxide is used as the cathode and iron perchlorate is used as the electrolyte.
- ▶▶ With 54% capacity retention at the end of 50 cycles of charging and discharging, the battery display good stability. It is possible to fabricate the battery under ambient conditions too.

Benefits:

- ▶▶ The iron ion battery is cost-effective and can store a high amount of energy.
- ▶▶ With the world turning its attention to electric vehicles, the focus is on developing batteries that are cheaper. Iron is more stable during the charging process and therefore prevents short-circuiting of the batteries.
- ▶▶ The amount of energy that can be drawn from the iron ion battery is 220 Wh per kg, which is 55-60% of lithium ion battery's performance.