Supercritical carbon dioxide(SCD)

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In news– Researchers at IIT-Madras have found that **supercritical carbon dioxide can be a good agent for simultaneous carbon dioxide sequestration.**

Key findings-

- Apart from simultaneous carbon dioxide sequestration SCD can be a good agent for enhanced oil recovery (EOR) from depleted reservoirs when the gas is used along with surfactants in a 'surfactant-alternating gas (SAG) injection' approach. (Above a certain temperature and pressure, carbon dioxide acquires properties that are midway between gas and liquid – denser and easy to pump – known as supercritical state.)
- In this process, carbon dioxide gas is injected in the reservoir, where it becomes supercritical, followed by injection of water or surfactant solution.
- The **study shows that the use of supercritical carbon dioxide for EOR resulted in greater storage of carbon dioxide for both water-alternating gas (WAG) and SAG approaches.**
- However, SAG performed better at all pressures and temperatures as surfactant solution alters the interfacial tension between the oil and water phases, leading to a higher oil recovery percentage and more effective storage of carbon dioxide.
- The researchers also found that the reservoir pressure and temperature had a strong effect on the flow dynamics.
- This method not only **promises improved recovery of oil but also safe, enhanced, and permanent storage of carbon dioxide gas emitted from human and other anthropological**

activities, for both WAG and SAG approaches

- **The use of supercritical carbon dioxide reduces oil viscosity, induces in situ swelling of the oil,** and reduces the interfacial tension of the in-situ fluid system.

What is supercritical carbon dioxide?

- **Supercritical carbon dioxide (CO2) is a fluid state of CO2 where it is heated and held at or above its critical temperature and pressure.**
- In this supercritical phase, CO2 exhibits properties and behaviors between that of a liquid and a gas.
- In particular, **supercritical CO2 possesses liquid-like densities with gas-like diffusivity,** surface tension and viscosity.
- **When CO2 exceeds temperatures** of 31.1°C(87.9°F) and is subjected to pressures above 7.39 MegaPasca (1071 psi), it enters the supercritical phase.
- **This phase of CO2 is commonly used as a solvent in chemical extraction processes** due to its high solubility, low toxicity and minimal net effect on the environment.