

# 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 (CO<sub>2</sub>) is a fluid state of CO<sub>2</sub> where it is heated and held at or above its critical temperature and pressure.**
- In this supercritical phase, CO<sub>2</sub> exhibits properties and behaviors between that of a liquid and a gas.
- In particular, **supercritical CO<sub>2</sub> possesses liquid-like densities with gas-like diffusivity,** surface tension and viscosity.
- **When CO<sub>2</sub> 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 CO<sub>2</sub> is commonly used as a solvent in chemical extraction processes** due to its high solubility, low toxicity and minimal net effect on the environment.