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ABSTRACT:

Impact of Anisotropy and Electromagnetic Modified Effect on Fluid Mobility in Reservoir Sandstone

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The necessity for oil and gas has accelerated research in magnetic nanotechnology. The petroleum business is quickly changing, and a huge advancement in the application of nanotechnology in this field is envisaged. Because magnetic nanoparticles are solid, tiny, and adsorb at the oil-water interface, they might be useful. The interaction of MNP with electromagnetic waves appears to be capable of altering interfacial tension, which will boost oil recovery. The interaction of an oscillating B-field of electromagnetic waves with magnetic domains causes energy dissipation as a result of a shift in magnetic anisotropy from the easy axis of magnetization. The use of anisotropy energy in mobilising oil in a porous media has recently been investigated. BaTiO3 nanoparticles (NPs) were synthesised for this purpose, and their influence on oil mobilisation under electromagnetic waves (EM) was studied. The anisotropy energy was computed and determined to be 7.34 kJ/mol. The complete magnetization of a ferromagnetic material tends to remain in one direction, known as the easy axis. Under EM, the easy axis magnetization of BaTiO3 nanoparticles oscillates and changes direction continually, facilitating oil mobilisation in the porous media. The EM findings for reducing IFT between oil and water ranged from 4.5mN/m to 0.89mN/m. Under EM, it was discovered that BaTiO3 nanoparticles may lower IFT by roughly 60%. The IFT must be small enough to allow oil flow during mobilisation. The simulation findings demonstrate that the adsorption energy of n-hexane on the surface of hematite has a 47.9% lower energy value than water. With a 115.4% percentage difference, the stress autocorrelation function of n-hexane with hematite is greater than that of water.