# EXPERIMENTAL INVESTIGATION OF SCALE FORMATION AND PREDICTION BY A NOVEL METHOD, ELECTRICAL CONDUCTIVITY

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## ABSTRACT
One of the most serious problems in the water injection process is scale formation occurrence when injection water is incompatible with formation brine. These two waters interact chemically and precipitate inorganic minerals. For example seawater with high concentration of sulfate ions as injection water reaches to formation water with cationic ions. The purpose of this study is to predict the permeability reduction caused by deposition of scales in sandstone cores from mixing of injected sea water and high salinity formation water at various temperatures (60-100 °C) and differential pressures (50-150 psig). A very common way to predict the scale formation is running core flood experiments in a way that first, the core was saturated with formation brine and set to desired temperature then sea water was injected at a constant pressure and continuously by measuring flow rate the permeability was recorded with time. But several factors like particle movement, clay swelling and pore throat blocking by fines migration can disturb flooding test results and make doubt in predictions. As a new method by measuring the electrical conductivity of outlet water the scale formation was predicted independent of non-related parameters mentioned above. Electrical conductivity of outlet water dropped out of the range between injection and formation water electrical conductivities, so it shows a decrease in free ion concentration in mixed waters as a result of scale formation and precipitation in core. The results showed that calcium, strontium, and barium sulfates are formed and cause permeability damage. $CaSO_4$ and $SrSO_4$ scales will deposit more in higher temperatures but BaSO4 scale deposit less. At higher pressures all of them precipitate more.

**Keywords:** Formation damage, Incompatible waters, Inorganic scale formation, core flood, permeability decline, Electrical Conductivity.

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