Sulfide scavengers can suitably be an aldehyde or ketone.

Viscoelastic surfactants can be chosen from the group of amine oxides or carboxyl butane based surfactants.

High temperature applications may benefit from the presence of an oxygen scavenger in an amount of less than about 2 volume percent of the solution.

At the same time the fluids can be used at an increased pressure. Often fluids are pumped into the formation under pressure. Preferably, the pressure used is below fracture pressure, i.e. the pressure at which a specific formation is susceptible to fracture. Fracture pressure can vary a lot depending on the formation treated, but is well known by the person skilled in the art.

In the process of the invention the fluid can be flooded back from the formation. Even more preferably, (part of) the solution is recycled.

It must be realized, however, that GLDA, being a biodegradable chelating agent, will not completely flow back and therefore is not recyclable to the full extent.

The invention is further illustrated by the Examples below.

Examples

General procedure for core flooding experiments

Figure 1 shows a schematic diagram for the core flooding apparatus. For each core flooding test a new piece of core with a diameter of 1.5 inches (3.81 cm) and a length of 6 or 20 inches (15.24 or 50.8 cm) was used. The cores were placed in the coreholder and shrinkable seals were used to prevent any leakage between the holder and the core.

An Enerpac hand hydraulic pump was used to pump the brine or test fluid through the core and to apply the required overburden pressure. The temperature of the preheated test fluids was controlled by a compact bench top CSC32 series, with a 0.1° resolution and an accuracy of ± 0.25% full scale ± 1°C. It uses a type K thermocouple and two Outputs (5 A 120 Vac SSR). A back pressure of 1,000 psi (6.9 x 10^6 Pa) was applied to keep CO_2 in solution.

The back pressure was controled by a Mity-Mite back pressure regulator model S91-W and kept constant at 300 - 400 psi (2.07 x 10^6 – 2.76 x 10^6 Pa) less than the overburden pressure. The pressure drop across the core was measured with a set of FOXBORO differential pressure transducers, models IDP10-A26E21F-M1, and monitored by lab view software. There were two gauges installed with ranges of 0-300 psi (0 – 2.07 x 10^6 Pa), and 0-1500 psi (0 – 1.03 x 10^7 Pa), respectively.

Before running a core flooding test with sandstone or carbonate, the core was first dried in an oven at 300°F (149°C) or 250°F (121°C) and weighted. Subsequently, the sandstone core was saturated with 5wt% NaCl brine at a 2,000 psi (1.38 x 10^7 Pa) overburden pressure and 1,000 psi (6.89 x 10^6 Pa) back pressure, whereas the carbonate core was saturated with water at a 1,500 psi (1.03 x 10^7 Pa) overburden pressure and a 500 psi (3.45 x 10^6 Pa) back pressure. The pore volume was calculated from the difference in weight of the dried and saturated core divided by the brine density.

The core permeability before and after the treatment was calculated from the pressure drop using Darcy's equation for laminar, linear, and steady-state flow of Newtonian fluids in porous media:

$$K = (122.81q\mu L)/(\Delta pD^2)$$

where K is the core permeability, md, q is the flow rate, cm^3/min, μ is the fluid viscosity, cP, L is the core length, in., Δp is the pressure drop across the core, psi, and D is the core diameter, in.

Prior to the core flooding tests the cores were pre-heated to the required test temperature for at least 3 hours.

19. Fluid of any one of claims 13 to 17 suitable for use in treating an illite-containing sandstone formation wherein the surfactant is a nonionic or anionic surfactant.

20. Fluid of any one of claims 13 to 19 when used for treating an illite-containing formation.