

Citric Acid

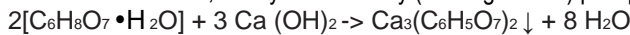
CITRIC ACID (C₆H₈O₇) is a commercial chemical used to reduce pH, precipitate soluble calcium and sequester iron. It is used to reduce pH and remove calcium when drilling cement, to reduce the potential of crosslinking polymers (xanthan and others) from iron and to prevent fish-eyes when mixing polymers. CITRIC ACID is an organic acid and is less reactive than sulfuric or hydrochloric acid, thereby being somewhat safer to handle. CAUTION: See product handling information.

Typical Physical Properties

Physical appearance Opaque to white granules
 Specific gravity 1.542
 Solubility @ 68°F (20°C) 169 g/100 ml water

Application

CITRIC ACID is used to reduce pH and remove calcium when treating cement contamination. This chemical reaction forms calcium citrate, a very low solubility (0.085 g/100 ml) precipitate, as follows:



When using CITRIC ACID to treat cement contamination:

$$\text{CITRIC ACID (lb/bbl)} = \text{Excess lime (lb/bbl)} \times 1.893 \times Fw$$

Where:

Fw = Water fraction from retort analysis (% water/100)

One pound (0.45 kg) of CITRIC ACID removes 0.53 lb (0.24 kg) of excess lime which is roughly equivalent to 0.78 lb (0.35 kg) of cement. When formulating polymer fluids, such as the FLOPRO* system or other xanthan-containing systems in oilfield waters with soluble iron contents above 40 mg/l, it is recommended to pretreat the water with 0.25 to 0.50 lb/bbl (0.7 to 1.43 kg/m³) of CITRIC ACID, reducing the pH to the 4.0 to 5.0 range, to sequester the iron and prevent fish-eyes. Pretreatment will prevent crosslinking and excess gelation of the polymer system. CITRIC ACID chelates iron at a ratio of 3.5:1 or 35 ppm CITRIC ACID to chelate 10 ppm Fe³⁺.

Advantages

- Widely available, multifunctional acid
- Reduces pH and removes calcium to pretreat or remedy cement contamination
- Sequesters soluble iron to prevent polymer crosslinking
- As compared to alternative acids, less reactive and safer to handle, i.e., better health, safety and environmental considerations

Limitations

- More expensive than other more reactive acids
- Supply is occasionally limited
- Requires higher treatments than alternative chemicals

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