

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.

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

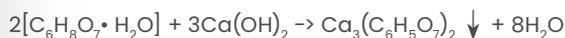
- More expensive than other more reactive acids
- Supply is occasionally limited
- Requires higher treatments than alternative chemicals

Typical Physical Properties

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

APPLICATIONS

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:

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

where:

$$\text{Fw} = \text{Water fraction from retort analysis (\% water/100)}$$

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⁺.

TOXICITY AND HANDLING

Bioassay information is available upon request.

Handle as an industrial chemical, wearing protective equipment and observing the precautions described in the Material Safety Data Sheet (MSDS).

Avoid exposure and handle only when fully protected. CITRIC ACID can burn eyes, skin and respiratory tract and can react violently with other chemicals, especially strong alkalis such as caustic soda or lime.

CITRIC Acid should be added slowly to the mud system through a properly designed mud hopper. Do not mix CITRIC ACID with other chemicals or through a chemical barrel which is used to mix caustic soda or other strong alkalis.

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PACKAGING AND STORAGE

CITRIC ACID is usually packaged in 50- and 100-lb (22.7- and 45.4-kg), or 55-lb (25-kg), multi-wall, paper sacks; numerous other sack sizes are used.

Store in a dry area away from water and alkaline materials. Keep all containers sealed. Once a container is opened it should be used immediately. CITRIC ACID is reactive and can be corrosive to certain materials. Spills should be cleaned up using protective equipment as described on the MSDS and with the utmost care.