

CAUSTIC SODA

CAUSTIC SODA is used in water-base muds as a source of hydroxyl ions to control pH.

CAUSTIC SODA, caustic, alkali and lye are all common names for sodium hydroxide (NaOH). It is a strong base which is extremely soluble in water and dissociates into sodium (Na) and hydroxyl (OH) ions in solution.

ADVANTAGES

- Widely available and an economic source of hydroxyl ions to control pH
- Concentrated chemical and very effective at small treatment levels
- Increases pH which reduces corrosion of steel exposed to drilling fluids
- Can be used in most drilling fluids

LIMITATIONS

- In high hardness brines such as CaCl₂, Williston, Michigan and Zechstein brines, CAUSTIC SODA cannot be used to effectively raise the pH due to the high level of cations which combine with hydroxyl ions to precipitate hydroxides such as Ca(OH)₂ and Mg(OH)₂.

Typical Physical Properties

Physical appearance	White beads, pellets, flakes or crystals
Specific gravity	2.13
pH (1% solution)	13.0
Solubility @ 86°F (30°C)	119 g/100 mL water

APPLICATIONS

CAUSTIC SODA is used to maintain or increase pH. Increasing pH with CAUSTIC SODA precipitates magnesium (Mg²⁺) and suppresses calcium (Ca²⁺) in high hardness waters such as seawater, reduces corrosion, and neutralizes acid gases such as carbon dioxide (CO₂) and hydrogen sulfide (H₂S).

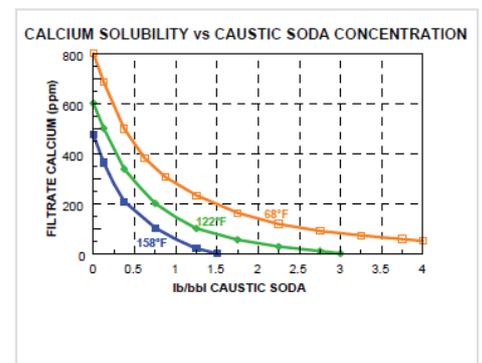
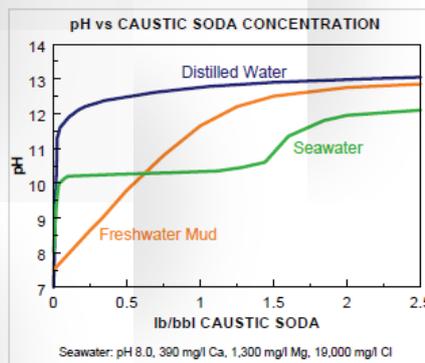
Typical concentrations range from 0.25 to 4 lb/bbl (0.7 to 11.4 kg/m³) with treatments depending on water chemistry and type of drilling fluid. In seawater and waters containing buffering salts, a higher concentration of CAUSTIC SODA is required. Gulf of Mexico seawater requires 1.5 to 2 lb/bbl (4.3 to 5.7 kg/m³) to precipitate all magnesium then convert the calcium to lime. See figures below showing pH and calcium solubility vs. CAUSTIC SODA concentration. When treating muds with lignosulfonate or lignite such as SPERSENE* or TANNATHIN* additives, which have low pH (±4), typical usage is one sack of CAUSTIC SODA for every four sacks of SPERSENE or TANNATHIN products.

When using CAUSTIC SODA to reduce hardness:

$$\text{CAUSTIC SODA (lb/bbl)} = [\text{Mg (mg/L)} \times 0.00115 \times \text{Fw}] + [\text{Ca (mg/L)} \times 0.0007 \times \text{Fw}]$$

where

Fw = Water fraction (% water/100)



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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).

WARNING! Avoid exposure and handle only when fully protected. CAUSTIC SODA is an extremely alkaline material and can cause severe burns to eyes, skin and respiratory tract, and may react violently with water or acids. Considerable heat energy is generated when CAUSTIC SODA is mixed with water and care should be taken when mixing.

CAUSTIC SODA should be added slowly to the mud system through a properly designed chemical barrel. Do not mix CAUSTIC SODA with other chemicals or through the mud hopper. When using the chemical barrel, fill to the desired level with water then add dry CAUSTIC SODA.

PACKAGING AND STORAGE

CAUSTIC SODA is packaged in 50-lb (22.7-kg), multi-wall, paper sacks with plastic liners. Other packaging includes fiberboard or steel drums of various sizes, as well as other sack sizes.

Store at room temperature in a dry, well-ventilated area. Keep in original container. Keep container closed. Keep away from heat, sparks and flames. Store away from incompatibles.