

أسس أجهزة التخدير الكورس الاول

Soda lime in the anesthesia machine



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الاهلية

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كلية التقنيات الصحية

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قسم تقنيات التخدير

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Lecture No4.

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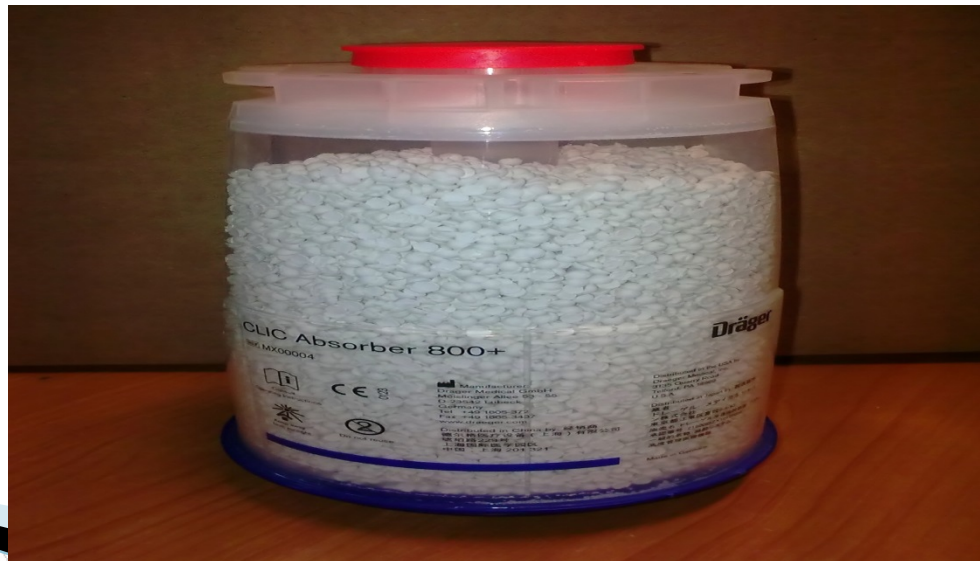
Soda lime

- Soda lime is a mixture of NaOH & Ca(OH)_2 chemicals, used in granular form in closed breathing environments, such as general anaesthesia, submarines, rebreathers and recompression chambers, to remove carbon dioxide from breathing gases to prevent CO_2 retention and carbon dioxide poisoning.



The main components of soda lime are

1. Calcium hydroxide, CaOH (75%))
2. Water, H_2O (20%))
3. Sodium hydroxide, NaOH (3%))
4. Potassium hydroxide, KOH (1%))



Is soda lime dangerous?

Soda lime, white or grayish white granular mixture of calcium hydroxide with sodium hydroxide or potassium hydroxide. A highly corrosive poison, soda lime severely damages the gastrointestinal tract if swallowed and may cause death.



Anaesthetic use



- Edit During the administration of general anaesthesia, the gases expired by a patient, which contain carbon dioxide, are passed through an
- anaesthetic machine breathing circuit filled with soda lime granules.
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Medical-grade soda lime includes an indicating dye that changes color when the soda lime reaches its carbon dioxide absorbing capacity. To ensure that a soda lime canister (CO₂ absorber) is functioning properly, it should not be used if the indicating dye is activated. Standard anaesthesia machines typically contain up to 2 kg of soda lime granules

Rebreather use

Exhaled gas must be passed through a carbon dioxide scrubber where the carbon dioxide is absorbed before the gas is made available to be breathed again. In rebreathers the scrubber is a part of the breathing loop.



Chemical reaction

chemical interaction The carbon dioxide is reacted with calcium hydroxide and this results in calcium carbonate and water with heat. The role of sodium hydroxide is to increase the reaction speed and absorption efficiency as it interacts with the dissolved carbon dioxide in the water forming sodium carbonate, which in turn interacts with the calcium hydroxide to produce carbonates. Calcium, water, and sodium hydroxide that participate in the reactions again.

The overall reaction is:



Each mole of CO₂ (44 g) reacting with calcium
.)hydroxide produces one mole of water (18 g)

The reaction mechanism of carbon dioxide with soda lime can be decomposed in three elementary steps:

1. $\text{CO}_2(\text{g}) \rightarrow \text{CO}_2(\text{aq})$ (CO_2 dissolves in water – slow and rate-determining)
2. $\text{CO}_2(\text{aq}) + \text{NaOH} \rightarrow \text{NaHCO}_3$
(bicarbonate) formation at high pH
3. $\text{NaHCO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O} + \text{NaOH}$ ((NaOH recycled to step 2) – hence a catalyst)



When should I change my soda lime?

For a standard anesthesia machine, Dispomed recommends changing the soda lime **after 14 hours** of use. However, keep in mind that soda lime may be exhausted faster than in **14 hours** and that you may have to change it more often than every 14 hours.



What is the pH of soda lime?

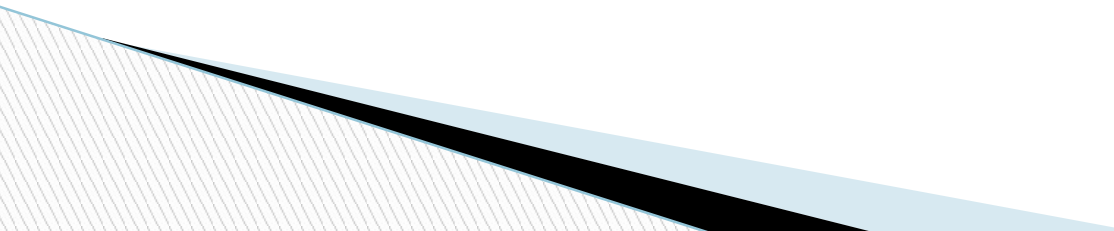
It has a pH of 13.5. Soda lime absorbs about 19% of its weight in carbon dioxide, hence 100 g of soda lime can absorb approximately 26 L of carbon dioxide.



How do you absorb carbon dioxide?

Lithium hydroxide. Other strong bases such as soda lime, sodium hydroxide, potassium hydroxide, and

lithium hydroxide are able to remove carbon dioxide by chemically reacting with it. In particular, lithium hydroxide was used aboard spacecraft, such as in the Apollo program, to remove carbon dioxide from the atmosphere.



Any questions?

*Thank
You*