

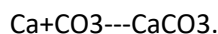


**FOCUS TRONIC**  
SETTING NEW STANDARDS

### Relationship between KH/Ca/Mg

#### **Theory behind relationship between KH/Ca/Mg concerning consumption and dosing**

In Chemistry we talk about numbers of molecule/ions. When a coral growth or another calcifying organism whatever, it makes it's skeleton by using Ca and CO<sub>3</sub> (Carbonate) ions in the ratio 1/1, because the formula for calcium-skeleton is CaCO<sub>3</sub>.



In Chemistry we talk about Molar, and that is only a unit for a certain amount of numbers of ions. So if the tank for instance consumes 5 Molar calcium-ions due to coral growth (Ca is NOT consumed by another process other than this), it also consumes exact 5 Molar carbonate ions (CO<sub>3</sub>). Therefore we only have to know the carbonate consumption to also know the Ca consumption.

Now: ALL correct made recipes are made in this way that if you take same volume of the KH solution as the Ca solution that will contain same number of ions (same Molar).

Ex: You take 10 ml of the KH solution, and that will contain X Molar carbonates (CO<sub>3</sub>), then 10 ml of the Calcium-solution will also contain exact X molar Ca-ions.

So, by just always adding the same amount in volume from the KH and Ca containers, you will add both Ca and KH in same ratio as they are consumed.

It's the same for Mg, but there the ratio is not that fixed, but on the other hand so much lower ratio, so the dose is not crucial. For a calcareous algae we estimate that Mg stands for 4% of the total Ca+Mg content. In a SPS coral its only 1%. Therefore, the Mg content is reasonable lower in the Balling/Dosing recipes and we are talking about a ratio of KH/MG of around 95/1 (This can vary some due to that the ratio is not that fixed and very low). That means that also Mg consumption follows the dKH consumption, but with some more flexibility. But as the Mg part is that small, is not crucial at all to know the exact KH/MG ratio.

Some tank starts with an unbalance between Ca and KH (Like Ca 500 ppm, KH 7dKH), due to different salt-mixes or bad handled dosing regimen of the user. In that case you can temporary have to dose not equal from the Balling/dosing- channels. BUT still it consumes Ca and KH in ratio 1/1 of course. And second: Ca tests are not that accurate, so do NOT tempt to chase numbers concerning Ca. As long as Ca is within 390-460 ppm I would say you have NO unbalance at all from start, and should follow the original rules to dose Ca/KH in volume ratio of 1/1.

It's also good to know this: We have talked about ratio 1/1 in aspects of number of ions, Molar. If you want to interpret this into mg/l, just to get a feeling how much more accurate it is to measure dKH instead of Ca to conduct the Balling dosing, then: 1.00 dKH consumption corresponds to 7 ppm Ca consumption (that is same as the numbers/molar-ratio 1/1). Then we all understand that IF we should instead conduct the Balling doses by measuring Ca (It's of course possible to do that), and we at least want same resolution as the dKH measurement (0.05dKH), then we have to measure Ca with accuracy and resolution of 0.35 ppm Ca. That's NOT possible with the best test ever.

If we turn around the theory, and check what accuracy we can get from a Ca -test, we will in best case get 10 ppm. 10 ppm Ca accuracy/resolution corresponds to a dKH measurement resolution of 1.4dKH!

SO: Imagine to have a Balling-dosing regime, based on a dKH measurement of only 1.4dKH! NO one will even consider that. That will turn the tank into a guessing game, and that is what is going to happen if Ca-measurement will conduct the Balling-Dosing regimen.

So, the most accurate, balanced, safe and chemical correct, is to ONLY let dKH measurement conduct the dosing of ALL elements in a dosing/Balling-regimen. To dose unbalanced temporary can be done if you by a manual or ICP test detect a significant unbalance, due to that you started with that unbalance from scratch, due to for instance a not balanced salt mixture or previously bad handling of the user concerning the dosing regimen.

/Jonas Roman

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