Calcium Reactors for Aquariums: Advantages, Set Up, and Maintenance

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As calcium supplementation has become more automated, one of the more sophisticated means of achieving the desired goal is the use of the calcium reactor. Carbon dioxide (CO_2) is pumped, at a fixed rate, into a chamber filled with a calcareous (containing lime) media or Korallith. The CO_2 lowers the pH in the chamber to an acidic level, which dissolves the calcium into the water. The amount of calcium that is released is controlled by the flow rate of water through the chamber as well as by the rate of release of the carbon dioxide bubbles. This process also dissolves nearly all of the minerals and trace elements corals need to grow. The dissolved solution increases alkalinity (carbonate hardness) to stabilize pH while replenishing minerals (trace elements).

Advantages

Calcium reactors are popular for several reasons:

- Over the long term, this method is relatively inexpensive in that all that is needed are carbon dioxide and a calcareous media.
- When used properly, this method provides a very precise means of maintaining calcium levels within a system.
- There are now calcium reactors on the market that can handle even the largest tanks, so it is possible to find a reactor for every tank size.

Disadvantages

Like all methods, calcium reactors are not without some drawbacks.

- These units are relatively expensive initially. In addition to the reactor itself, a properly set up unit will also require a carbon dioxide bottle, a regulator and needle valve, and a means for assessing pH.
- Care must be taken in the selection of the media. Some media may contain a lot of phosphate, so that as the media dissolves, phosphate is released, as well. Fortunately, in the last year, phosphate-free media such as Korallith is now available.
- The amount of carbon dioxide being introduced needs to be closely monitored so that excessive carbon dioxide is not leaked into the aquarium. If this occurs, a constantly low pH reading will result. However, when a properly functioning needle valve and bubble counter are being used in combination with a pH monitor, there usually is no problem.
- Calcium reactors may increase alkalinity to excessively high levels if they are not monitored closely. This can be controlled by the addition of calcium chloride from time to time, or by adjusting the flow rate and the rate of carbon dioxide introduced.

Calcium reactor set-up

The set-up and maintenance of a calcium reactor is rather straightforward. The long-term maintenance of the reactor is where problems often occur.

You will need the following components for the system:

- A calcium reactor with a recirculating pump
- A CO_2 bottle with regulator and solenoid valve
- pH controller and probe
- Calcareous media or Korallith
- Appropriate hoses and connectors

To set-up the system:

1. The calcium reactor is assembled and placed in or next to the sump of a wet/dry filter.
2. Before turning on the reactor, the calcium and alkalinity levels should be tested and noted so that a baseline is established. These levels will then be used to determine when the reactor is working at an optimum level.
3. The reactor should then be filled with rinsed media, and all of the hoses should be attached.
4. Once the reactor is filled with media, and connected to a CO_2 source and water source from the tank, the flow should initially be set so that 1-2 bubbles per second can be counted in the bubble counter. The water flow should be set so that 1-2 liters of water per hour flow through the reactor.
5. After a day, the effluent (water stream or flow coming from the reactor) should be checked to see that it has a pH of approximately 6.5. If the pH is higher, then the bubble count can be increased, or the flow of water reduced. It is

usually better to adjust the CO_2 bubbles, as reducing the water's flow will reduce the amount of calcium and carbonates flowing into the tank.

6. Once these flows have been adjusted, the reactor should be allowed to run for a few days, after which time, the calcium and alkalinity levels should be measured. At this time, the levels should be at least equal to the initial levels, or they should be slightly higher (assuming they were originally within the normal range). If they are lower, then the flow and the CO_2 bubble rate will need to be increased.

Calcium reactor maintenance and important maintenance checks

A calcium reactor is very easy to operate as long as it is understood that to dissolve the calcareous media, the pH will need to be around 6.5. If the flow through the chamber needs to be increased to raise the amount of calcium flowing into the tank, then the bubble rate will also need to be increased. Care should be taken, however, that the CO_2 dispersal rate is not too high. If this happens, the pH coming from the reactor will be very low, and there will be excess CO_2 in the water. This low pH can have deleterious effects on the invertebrates, and the excess CO_2 can trigger unwanted algae growth. To reduce the likelihood of this becoming a problem, the effluent coming from the reactor can be run over or through a second chamber containing media. This will help to prevent excess CO_2 from being released and will allow more calcium to be dissolved. As long as these conditions are maintained, there is little problem in running the reactor, but the levels for calcium and alkalinity should still be monitored closely to make sure that everything is working properly.

Important maintenance checks

Without proper maintenance, calcium reactors can cause multiple problems. Perform regular checks on your system.

- The most frequently encountered problem is that the outflow from the reactor may slow down over time, often in just a day or two. If this is not remedied, the alkalinity and calcium levels can fall quite quickly. For this reason, the outflow should be checked daily to make sure it is at a proper rate.
- Another problem is that, over time, media other than Korallith may turn into a type of inert sludge in the reactor. As a result, the amount of calcium being released is reduced, even though the flow and CO_2 levels look normal. To remedy this, the media should be removed and thrown out once or twice per year and the whole reactor should be cleaned out with mild vinegar and thoroughly rinsed. This will help to keep the reactor working at an optimum level.
- Also, over time, the flow through the reactor may become reduced. The reactor, pipes, and valves need to be cleaned from time to time.
- For tanks containing large quantities of small polyp stony (SPS) corals that utilize a lot of calcium, the flow rate through the reactor may have to be increased constantly, as these corals consume more and more calcium.
- It is wise to periodically check the accuracy of the pH controller with a pH test kit (some testers calibrate ±0.01 accuracy) to ensure that the calcium reactor is working properly.

I have now been using a reactor for over five years on one of my tanks, and other than getting it adjusted initially, it has produced very few problems. While there are considerable start-up costs associated with implementing such a system, a calcium reactor may prove to be a wise long-term investment by saving you time, money, and frustration while maximizing your coral growth.