Aragonite Myths

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• Calcium carbonate
  o Three polymorphs
    ▪ Calcite – hardest, most stable
    ▪ Aragonite – mid hardest
    ▪ Vaterite – weakest, most unstable, hard to find naturally occurring
  o Calcite
    ▪ Limestone
    ▪ Coral skeletons
  o Aragonite
    ▪ Near or in limestone deposits
    ▪ Oceans
    ▪ Converts to calcite
      ▪ Time in the environment (by action of CO2)
      ▪ Heated to over 380C
  o Hard to tell the difference between calcite and aragonite
    ▪ ...first myth (use vinegar)
• Myths
  1. If it fizzes with vinegar, it’s aragonite
     i. Vinegar (acetic acid) reacts with the calcium, releasing CO2
     ii. If a sample contains high calcium content, it will react vinegar, even if it’s not aragonite
     iii. Demonstration w/ vinegar
     iv. How mineralogists test for aragonite vs. calcite
        1. Feigl’s Solution demonstration
  2. Oolitic refers to grain size
     i. Oolitic means “egg shaped”
     ii. Formed by calcium precipitation layering on a hard object
        1. Other oolites
        2. Bits of coral or shell
        3. Certified as a pearl by USDA or USGS (?)
  3. Aragonite will not dissolve in a reef tank (buffering pH)
     i. Aragonite will not dissolve in the reef tank pH of over 8.2 pH
     ii. Biological respiration generates CO2, which decreases pH
     iii. Intense biological respiration in the sand bed can decrease pH significantly
  4. Aragonite is just good for adding calcium
     i. Contains: Calcium, Phosphourous, Magnesium, Potassium, Sodium, Sulfur, Boron, Copper, Iron, Manganese, Zinc, Silica Dioxide, Selenium
  5. Aragonite mining in the Caribbean is harmful to the environment
i. Caribbean waters produce 20 million tons annually
ii. USDA Certified material being dredged is less than 6 years old
iii. Dredged by “mowing the lawn”
iv. Looks like it’s snowing in some underwater areas in the Caribbean

6. Coarse grade aragonite is as good as fine aragonite for deep sand beds
   i. Deep sand beds are designed for denitrification
   ii. Healthy deep sand bed requires the top layers to remain oxygenated
   iii. Proper grain size promotes proper microfauna
   iv. Suggested grain size is 0.065-0.125mm

7. Crushed coral (or silica) is as good as aragonite for biological filtration
   i. Aragonite is very porous
   ii. Surface area greater than 1.82 square meters per gram!

8. Crushed coral (or silica) is as good as aragonite for a sand bed
   i. Oolitic shape of aragonite keeps sand from packing
      1. Like marbles in a jar
   ii. Crushed aggregate, such as crushed coral and silica, pack tightly
   iii. Tightly packed substrate leads to low oxygenation and anaerobic conditions

9. Using aragonite from your old tank is okay
   i. Absorbs phosphates
   ii. Used as a phosphate scrubber in coal fired power plants
   iii. Used in runoff barriers for farms that use a lot of fertilizers
   iv. As good as aragonite is at absorbing phosphates, it can also release these in a new tank, causing algae issues

10. Aragonite is just used for the aquarium trade
    i. Agriculture to increase calcium uptake and decrease magnesium blocking
    ii. Cosmetics
    iii. Pharmaceuticals for calcium and as a binder
    iv. Plastics
    v. Glass
    vi. Paper
    vii. Concrete – high porosity make very strong concrete

11. Used aragonite can carry pathogens
    i. Negative zeta potential
    ii. Repels viruses and gram negative bacteria, which are the cause of many fish diseases
    iii. Used in marine aquaculture in place of UV sterilization in some systems
    iv. Natural protection

12. Black aragonite is the same as white aragonite
    i. Calcium carbonate in it's purest form is clear as glass
    ii. Contaminants in the calcium carbonate cause color changes
    iii. Black aragonite is high in iron, which can lead to algae issues (although isn't iron used to reduce phosphates?)