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membranes

Ion exchange membranes allow the passage of certain ions (like nitrates) while restricting others (like hydroxide ions that affect pH).1 This allows nutrients to flow between tanks while maintaining different pH levels. Cation exchange membranes only allow positively charged ions (cations) to pass through, while anion exchange membranes only allow negatively charged ions (anions) to pass.1 Using the appropriate membrane type can help control pH differentials. The decoupled Aquaponics approach separates the fish and plant components, allowing independent control of conditions like pH in each compartment.12 The membrane acts as the interface between the two loops. Additional pH adjustment (e.g. acid/base additions) may still be required in each tank to maintain the desired levels after nutrient exchange through the membrane. Separate Recirculating Systems: Set up two entirely separate recirculating aquaponics systems, each with its own fish tank, growing tank, and water pump. This allows for complete control over the pH levels in each system independently. pH Adjustment in Individual Growing Tanks: Instead of adjusting the pH in the fish tank or sump, you can adjust the pH directly in each growing tank by adding pH adjusters (e.g., acids or bases) to the water in the respective tanks. However, this method may require more frequent monitoring and adjustment. Buffering Agents: Incorporate buffering agents or substrates in the growing tanks to help maintain the desired pH levels. For example, using a calcium-based substrate like crushed oyster shells or limestone can help buffer and raise the pH in one tank, while using a substrate like peat moss can help lower the pH in the other tank.

Reverse osmosis (RO) membranes are typically made of synthetic materials like:

Polyamide (PA) or polyamide-based composites

Cellulose acetate (CA) Polytetrafluoroethylene (PTFE or Teflon) In addition to RO membranes, there are various other types of filtration membranes made from different materials, including:

Polycarbonate (PC) - used for microscopy and particle/cell size fractionation

Polyvinylidene fluoride (PVDF) - hydrophobic, used for organic solvents Nylon - hydrophilic, used for filtering water and organic solvents Cellulose nitrate - used for microbial control and quality control Polyethersulfone (PES) - hydrophilic, low protein binding Glass fiber - used for prefiltration and air/gas filtration These membranes are designed to selectively filter and separate different types of particles, molecules, and contaminants, based on their pore size and material properties:

RO membranes are designed to remove salts and other dissolved solids from water

Other membranes can filter out microorganisms, particles, proteins, and other specific substances

pollution allowance

The toxicity of ammonia increases with higher pH levels. Saltwater and brackish water aquariums tend to have higher (more alkaline) pH, so the fish inhabiting these environments have likely adapted to tolerate higher ammonia levels.

organic ph organic ammonia organic nitrite

hardiest

Mollies - The search results indicate that mollies can tolerate a wide range of salinities and adapt well to full saltwater conditions. Eels - Eels are also mentioned as a potential saltwater fish option for this type of setup. Puffers - Puffers can potentially survive in a saltwater aquarium, though they may require some brackish water. Shrimp and crabs - The search results suggest that shrimp and crabs are other saltwater organisms that could potentially thrive in this environment. Certain freshwater fish that can tolerate some salinity, like some cichlids and catfish.

NOAA

agricultural runnoff

nonpoint

cars, boats, farms and construction sites. Manufacturing plants in many areas of the world release toxic waste into the ocean, including mercury. While it has been banned in the USA, sewage also contributes to ocean pollution. Meanwhile, plastic waste poses a particularly tough challenge; according to the Ocean Conservancy, eight million metric tons of plastic go into our oceans every year.

Ocean mining

Litter

Oil spills and chemical pollution tolerant

plastic waste tolerant

acidication

carbolic acid

agricultural dump

hardy

sensitive and expensive

plants

aquatic plants (macrophyte)

wild rice (Zizania), water caltrop (Trapa natans), Chinese water chestnut (Eleocharis dulcis), Indian lotus (Nelumbo nucifera), water spinach (Ipomoea aquatica), prickly waterlily (Euryale ferox), and watercress (Rorippa nasturtium-aquaticum). Phytochemical and pharmacological researches suggest that freshwater macrophytes, such as Centella asiatica, Nelumbo nucifera, Nasturtium officinale, Ipomoea aquatica and Ludwigia adscendens, are promising sources of anticancer and antioxidative natural products. The search results discuss some epiphyte species that can tolerate cold temperatures to a certain degree, such as Epidendrum magnoliae and Coelogyne Unchained Melody. However, these plants are only able to withstand brief periods of frost or light freezing, not the prolonged, extreme cold of a Saskatchewan winter. The search results indicate that even the most cold-hardy epiphyte, Spanish moss (Tillandsia usneoides), has limits to its cold tolerance. While it can survive some frost and freezing, it cannot withstand extended periods of sub-freezing temperatures like those experienced in Saskatchewan.

fish

pollution

ammonia and nitrite

warm

tilapia

salt and evaporation

fish

hypersaline 40-50ppt

tilapia

brine shrimp

pollution

ammonia and nitrite

warm

tilapia

cold

catfish trout

Merged Segment (.review/organized/H/Hyper Load.md)

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