



Solid phase denitrification: A sustainable technology for reducing nitrate and phosphate concentrations

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Water reuse in aquarium exhibits is limited by the accumulation of nitrate, which is toxic to many species. Nitrate removal by denitrification or assimilation into biomass reduces costs of water exchanges and artificial sea salts. Solid Phase Denitrification (SPD) uses a solid biopolymer as a carbon source to promote anaerobic denitrification and/or aerobic nitrate assimilation. Dissolved nitrate is transformed into either N_2 gas or solid biomass. SPD uses a biologically synthesized medium, Polyhydroxyalkanoate (PHA) as a consumable carbon source and bacterial substrate. AST introduced NP-Active Pearls to the home aquarium industry to reduce dissolved nitrate and phosphate. We are testing a larger pellet for the public aquarium market and will report on results at IAC.

At nitrate-nitrogen concentrations >50 mg/l, AST has achieved denitrification rates up to 1.5 g NO_3/l_{PHA} /day. As nitrate is a more energetically favorable metabolic source than sulfate there is little risk of hydrogen sulfide production when operating above 50 mg/l NO_3 . Under lower nitrate conditions the PHA media can be fluidized. Nitrate is removed by assimilation with the added benefit of phosphate reduction. There is no risk of hydrogen sulfide production and nitrate and phosphate concentrations are reduced to below 1 mg/l.