

# ReductionTech Hydroxyl Dispersal to the Ocean and the Atmosphere

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## Abstract

Hydroxyl targets all GHGs in the atmosphere when dispersed and stabilizes into hydroxide overnight. (in one hour in the ocean when sparged as bubbled oxide gas. Hydroxide accesses the carbonate chemistry of both the atmosphere and ocean water. Dispersal to ocean or air results in enhancements of GHG removal, based on wide peer-reviewed atmospheric, geochemical, and in situ biochemistry literature on hydroxyl radicals and hydroxide ions.

## Introduction

The following is a brief summary of some of our findings on the bench at ReductionTech with respect to  $O^*$ ,  $OH^*$  and  $OH^-$ . The dispersal technology emits the oxide ( $O^*$ ) radical, which forms  $2OH^*$  on contact with water in the moisture of the atmosphere or in oceanic water. This technology emits up to  $18T/yr$  of oxide/ $M^2$ .

The chemistry proceeds at relativistic speeds, offering a rapid response for GHG removal. There are minor losses to other reactions. In the ocean, pH mitigation, oxygenation, and carbonate formation and subsequent  $CO_2$  sequestration occur at the same time. PH of seawater on the bench has shown t-5-minute pH levels of over 10.5, oxygenation at 12+ with the same probe on the oxygen sensor setting.

A small pump operating at 12-14 PSIG can create enough force to sparge at ~3M depth based on water column testing. On a moving ship application, the drag effects on the spargers is potentially helpful. Pilot testing of a cluster of 8 cells on a craft, to optimize sparging depth and line pressurization, and craft speed with a pH probe laid downstream to the spargers, and a following sampling craft after 20 minutes, to quantify the changes being made. Based on initial tests, the waters tested all showed a long-lasting pH increase; two fully contained water samples' pH of 9+ lasted well over 3 months. This indicates that the dispersal route with this technology will ensure that the  $OH^*$  or  $OH^-$  persists well in situ.

The instillation of pure  $OH^*$  into open saltwater means that the warmed oxide gas will experience in-line-cooling, and thus the  $OH^*$  will tend to stabilize in the seawater into  $OH^-$  faster than it does in air. This means that as a ROS, (reactive oxygen species), it is relatively weaker. These effects will minimize any potential ROS damage to species in the ocean. While this has yet to be quantified, we do think that the oxide gas is *not*  $O^{1D}$ , because it is heated modestly with low-medium grade thermal energy and not UV light like the ozone atom ( $O^{1D}$ ) is, thus it is likely less energetic/reactive.

With a modest amount of work, in situ verification of oxide sparging will yield the answers which will further guide a scaled ocean dispersal system platform. The logistics of mounting the system on the ship using skids, heavy-duty shipping containers, with a green on board energy supply may offer the ocean carbon mitigation field quite a near-ideal low-complexity/low complications chemistry solution which adds to the health of the oceans without unwanted residues and side reactions. We suggest that this remedy is a good match for reversing mild to severe Canfield Ocean states, as well as ensuring the long term carbon sequestration ability of the ocean and finally preservation of biodiversity.

## References

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