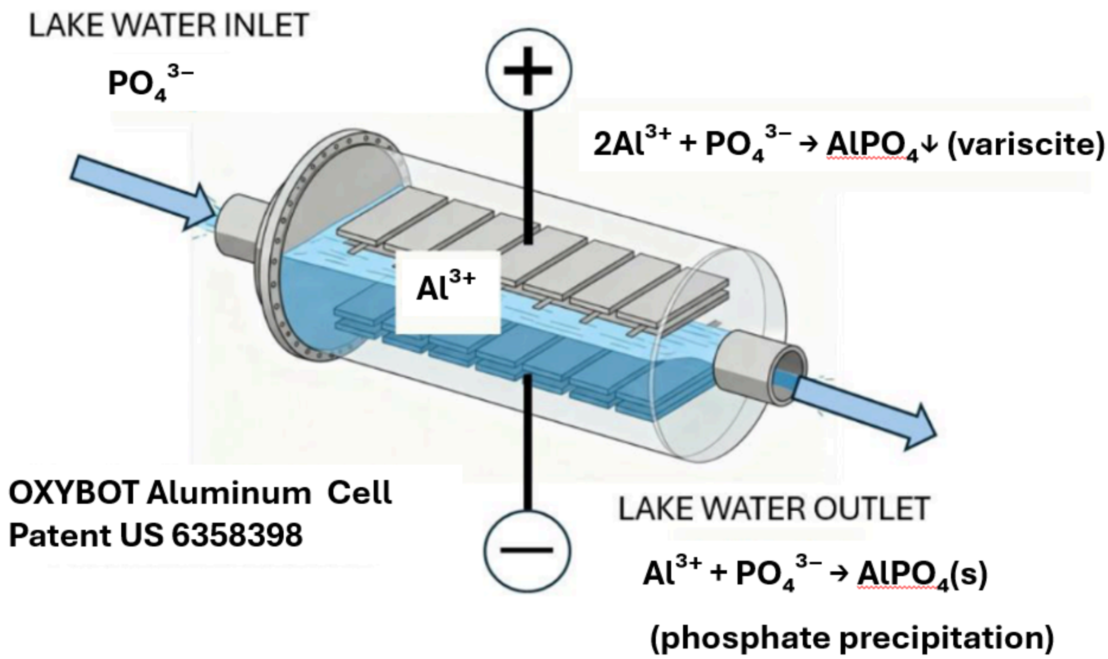
Oxybot's Aluminum Electrocoagulation Cell

Oxybot integrates an advanced aluminum-based electrocoagulation cell that actively removes excess phosphorus from lake water by chemically binding it as part of a stable mineral form—the same core chemistry that has successfully restored lakes such as Lake Ketchum in Washington State and over 100 similar projects across North America.



The Process

In this process, Oxybot first destroys problematic algae and pathogens through cavitation and plasma oxidation, then introduces Al^{3+} ions from aluminum electrodes, which rapidly react with dissolved phosphate ions (PO_4^{3-}) in lake water to form insoluble aluminum phosphate minerals, following the primary reaction:

$2Al^{3+} + PO_4^{3-} \rightarrow AlPO_4\downarrow$ (variscite)

or in more complete form:

$Al^{3+} + 3H_2O \rightleftharpoons Al(OH)_3 + 3H^+$ (initial hydrolysis)

$Al(OH)_3 + H^+ \rightleftharpoons Al(OH)_2^+ + H_2O$ (continued hydrolysis)

$Al^{3+} + PO_4^{3-} \rightarrow AlPO_4(s)$ (phosphate precipitation)

Mineral Stability

The resulting aluminum phosphate, when hydrated in natural sediments, forms variscite ($AlPO_4 \cdot 2H_2O$) or related aluminum phosphate minerals. Variscite is a naturally occurring, highly stable mineral found in healthy lakebeds, recognized for locking away phosphorus long-term and preventing its re-release into the water column, thus suppressing future algal blooms.

Environmental Safety

Unlike harsh chemical treatments, aluminum is non-toxic when properly dosed and has a long history of safe use in alum lake restoration projects. Its use for phosphorus removal is widely documented and supported in scientific lake management literature. Aluminum phosphate minerals mimic natural sediment chemistry, making them restorative for ecosystems rather than introducing foreign contaminants.

Dual-Action Advantage

This dual-action system—combining physical destruction of algae via cavitation and plasma with electrochemical phosphorus removal via aluminum—immediately improves water clarity and supports a balanced, self-sustaining lake environment. By reducing the bioavailable phosphorus pool, Oxybot helps shift the lake from bloom-prone conditions toward long-term resilience and recovery.