Improved DBP elimination from swimming pool water by continuous combined UV and ozone treatment

Chlorine is the most frequently used disinfectant and oxidant for maintaining swimming pool water quality; however, it reacts continuously with dissolved organic matter to produce disinfection by-products (DBPs), which are a health risk for pool users. UV treatment is used widely to remove chloramines, which are the most prevalent group of DBPs, albeit chloro-organic DBP concentrations often increase during post-UV chlorination.

In this work, UV and ozone treatments were investigated as additional technologies to eliminate DBP formation and their precursors. Batch experiments were conducted under controlled conditions, using realistic UV and ozone dosages and real pool water samples collected from a public swimming pool.

A gradual increase in all investigated DBP concentrations and predicted toxicity was observed during chlorination after repeated UV treatments, and concentrations of certain DBPs also increased during post-ozone chlorination. Based on ozone and chlorine’s similar reactivity, ozone was used directly after UV treatment to decrease the induction of DBP formation. Most DBP concentrations decreased during repeated combined treatments. It was also observed that DBP formed by post-ozone chlorination was removed by photolysis, thereby indicating synergy between the treatments. Repeated treatments using realistic UV and ozone dosages predicted that water quality will improve as a result of continuous combined UV and ozone treatments.