Effect of medium-pressure UV-lamp treatment on disinfection by-products in chlorinated seawater swimming pool waters - DTU Orbit (17/02/2019)

Effect of medium-pressure UV-lamp treatment on disinfection by-products in chlorinated seawater swimming pool waters
Several brominated disinfection by-products (DBPs) are formed in chlorinated seawater pools, due to the high concentration of bromide in seawater. UV irradiation is increasingly employed in freshwater pools, because UV treatment photodegrades harmful chloramines. However, in freshwater pools it has been reported that post-UV chlorination promotes the formation of other DBPs. To date, UV-based processes have not been investigated for DBPs in seawater pools. In this study, the effects of UV, followed by chlorination, on the concentration of three groups of DBPs were investigated in laboratory batch experiments using a medium-pressure UV lamp. Chlorine consumption increased following post-UV chlorination, most likely because UV irradiation degraded organic matter in the pool samples to more chlorine-reactive organic matter. Haloacetic acid (HAA) concentrations decreased significantly, due to photo-degradation, but the concentrations of trihalomethanes (THMs) and haloacetonitriles (HANs) increased with post-UV chlorination. Bromine incorporation in HAAs was significantly higher in the control samples chlorinated without UV irradiation but decreased significantly with UV treatment. Bromine incorporation was promoted in THM and HAN after UV and chlorine treatment. Overall, the accumulated bromine incorporation level in DBPs remained essentially unchanged in comparison with the control samples. Toxicity estimates increased with single-dose UV and chlorination, mainly due to increased HAN concentrations. However, brominated HANs are known in the literature to degrade following further UV treatment.

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