

DOC removal by multi-stage ozonation-biological treatment

Abstract

Multi-stage ozonation-biological treatment process for dissolved organic carbon (DOC) removal was evaluated to apply for drinking water treatment. Waters with different types of DOC were used, i.e. a reservoir water for drinking water supply, a secondary effluent from a municipal wastewater treatment plant and a solution of humic substances extracted from leaf mold. The multi-stage ozonation-biological treatment process was compared with conventional single-stage ozonation-biological treatment process. Amount of DOC removed in biological treatment was defined as amount of biodegradable dissolved organic carbon (BDOC) in influent of biological treatment. DOC removal in the multi-stage ozonation-biological treatment was higher than that in the conventional single-stage ozonation-biological treatment with the same total ozonation time for the reservoir water and humic substances solution. Moreover, three- or four-stage ozonation for 5 min followed by biological treatment (total ozonation time 15 or 20 min) showed higher removal of DOC than the single-stage ozonation (60 min) and biological treatment. The higher DOC removal in the multi-stage treatment was due to the production of BDOC by ozonation. The long-term ozonation was not effective to produce BDOC because most of ozone was utilized to oxidize BDOC produced in the early stage of ozonation. In the multi-stage treatment, ozonation was effective to decompose refractory DOC and to produce BDOC because BDOC was removed by biological treatment. However, multi-stage ozonation-biological treatment was not effective for the secondary effluent. The reason seems to be high concentration of ozone scavengers in that water and low reactivity of DOC for ozone.

Keywords;

Ozonation; Biological treatment; Multi-stage; BDOC; DOC; Humic substance