Fig.1S Comparisons of DOM removal characteristic in W1 and W2

The DOM removal characteristic considering DOC and SUVA removal in W1 and W2 was comparatively presented in Fig.1S.

For W1 source water, it showed that DOM was mainly removed by adsorption mechanism. DOC removal rate was dramatically improved at the beginning, subsequently the ascending tendency became slower by steps with the increasing alum dosage. By comparison, charge neutralization was dominant for removing DOM in W2 with the removal trends that removal efficiency was raising to a steady level with the increase of alum dosage, and finally reached to a situation that continuously increasing removal efficacy failed to be obtained with further alum dosages. The difference of these two DOM removal models could be ascribe to the characteristics of DOM fractionations, and that could be removed by coagulation as well as the concentration of DOM in waters. In this study, for W2 water, each physical-chemical fractionation was more balanced despite of relatively high DOM concentration as compared to W1 source water. Thus, it was implied that the characterization of physical-chemical fractionations as one of key factors greatly influenced DOM removal.

From the changes of SUVA value, in W1 it was declined with the increase of alum dosage, illustrating the aromatic, unsaturated organics could be effectively removed and the characteristics variation of DOM fractionations was significantly obvious. Thus, the appropriate alum dosage of 12 mg/L was applied with considerations of chemical cost and higher DOM removal. By contrast, SUVA was gradually decreased with alum dosage and became stabilized at 15mg/L in W2, and the properties of DOM removed were approximately homogeneous.

Fig.1S Comparisons of DOM removal characteristic in W1 and W2

Fig. 2S Hydrophobicity (Up) and MW distribution (Down) of each condition

Fig.2S (a) displays the hydrophobicity of each condition. In control, HoA and HiM were the dominant fractionations, which accounted for 38.1% and 30.4%, respectively of W1,while the major fractionation of W2 was HiM, reaching up 66.8%. For W1 at recycling rate of 2% or 5%, the fraction of HoA decreased while HoN and WHoA increased as compared to control. However, at 8% the HoA and WHoA declined. As to W2, after 2, 5 and 8% FBWW2 was introduced, the fractionations of HoN and HoA raised, while that of WHoA and HiM was reduced. HoN increased largely with comparison to HoA from 1.2% in control to 28.3%, 14.1% and 17.3% at 2, 5 and 8% respectively. Changes in each fractionation of chemical properties were basically identical with recycling rate of 5% and 8%.

Fig.2S (b) presents the MW distribution of each case. In control test, the most dominance portion was distributed in the region of low-MW (<3KDa), taking up 59.5% and 75.6% in W1 and W2, respectively. For W1 in recycle trial, the low-MW (<1KDa) increased with a relatively higher recycling rate, that’s to say, the percentage of <1KDa was the highest at 8%. The 10~100KDa all decreased as compared to control. With respect to W2, at 2, 5and 8%, the 3~30KDa increased while that of 100KDa~0.45µm declined as compared to control, and the greatest reduction occurred at 8%.





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