Profile of dissolved organic nitrogen (DON) in full-scale ozone and biological activated carbon filter

Bing Liu\textsuperscript{a,b,*}, Li Gu\textsuperscript{b}, Xin Yu\textsuperscript{c}, Guozhong Yu\textsuperscript{a}, Chengmei Zhao\textsuperscript{a}, Qingfei Li\textsuperscript{a}, Huimin Zhai\textsuperscript{a}

\textsuperscript{a}School of Urban and Environmental Science, Xinyang Normal University, 237 Changan Road, Xinyang 464000, China, Tel. +86 376 6391700; emails: liubing_982002@163.com (B. Liu), guozhong1966@163.com (G. Yu), zhao1971@163.com (C. Zhao), qingfei1972@163.com (Q. Li), zhaihm8787@163.com (H. Zhai)

\textsuperscript{b}Key laboratory of the Three Gorges Reservoir Region’s Eco-Environment, Ministry of Education, Chongqing University, 174 Shazhengjie, Chongqing 400045, China, Tel. +86 23 65127815; email: gu_li1980@163.com (L. Gu)

\textsuperscript{c}Institute of Urban Environment, Chinese Academy of Sciences, 1799 Jimei Road, Xiamen 361021, China, Tel. +86 592 6190708; email: xinyu12020@163.com

Received 9 August 2013; Accepted 24 May 2014

\textbf{ABSTRACT}

The profile of dissolved organic nitrogen (DON) was investigated in a full-scale two-stage integrated process of ozonation and biological activated carbon (BAC) filtration. The variation of DON along the media depth of BAC filters was studied comprehensively. The results showed that 48.3\% of DON was removed in the two-step processes. Ozone can mineralize organic-N into inorganic-N or nitrogen gas, removing approximately 31\% of DON. To determine the variation of DON in the BAC filtration process, DON and other related parameters at different media depths of a BAC filter were studied. The results showed that the concentration of DON decreased from 1.6 to 1.2 mg/L in media depth of 0–10 cm and increased gradually from 1.2 to 1.4 mg/L at deeper depths of the media (10–200 cm). Similarly, the biomass concentration and microbial activity first increased rapidly and then decreased gradually along the media depth of the BAC filter. The proportion of the small molecular weight (<6 kDa) DON in influent, 10 cm media depth and effluent of the BAC filter increased from 91 to 93\% and then decreased from 93 to 87\%. In contrast, the variation of the large molecular weight (>20 kDa) DON had the opposite trend. The middle molecular weight fraction (6–20 kDa) of DON was almost unchanged. Soluble microbial products (SMPs) released by bacterial metabolisms might be the main source of DON variation in BAC filters. These SMPs contained aromatic protein-like fractions, which were confirmed by EEM analysis.

\textbf{Keywords:} Dissolved organic nitrogen (DON); Soluble microbial products (SMPs); Ozonation; Biological activated carbon filter; EEM

*Corresponding author.

1944-3994/1944-3986 © 2014 Balaban Desalination Publications. All rights reserved.