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Zhi-Jian Shi, Qiong Guo, Yi-Qun Xu, Dan Wu, Si-Mo Liao, Fu-Yue Zhang, Zheng-Zhe Zhang, Ren-Cun Jin

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**Mass transfer characteristics, rheological behavior and fractal dimension of
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**Zhi-Jian Shi, Qiong Guo, Yi-Qun Xu, Dan Wu, Si-Mo Liao, Fu-Yue Zhang,
Zheng-Zhe Zhang, Ren-Cun Jin***

College of Life and Environmental Sciences, Hangzhou Normal University,
Hangzhou 310036, China

*Corresponding author: Ren-Cun Jin

Tel.: +86-571-88062061; Fax: +86-571-28865333

E-mail address: jrczju@aliyun.com

Abstract

In this study, the mass transfer, rheological behavior and fractal dimension of anaerobic ammonium oxidation (anammox) granules in upflow anaerobic sludge blanket reactors at various temperatures (8.5-34.5 °C) and upflow velocities (0.06, 0.18 m h⁻¹) were investigated. The results demonstrated that a lower temperature increased the external mass transfer coefficient and apparent viscosity and impaired the performance of anammox granules. The external mass transfer coefficient was decreased, but efficient nitrogen removal of up to 96% was achieved under high upflow velocity, which also decreased the apparent viscosity. Furthermore, a fractal dimension of up to 2.93 achieved at low temperature was higher than the previously reported values for mesophilic anammox granules. A higher upflow velocity was associated with the lower fractal dimension. Because of the disturbance in granule

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