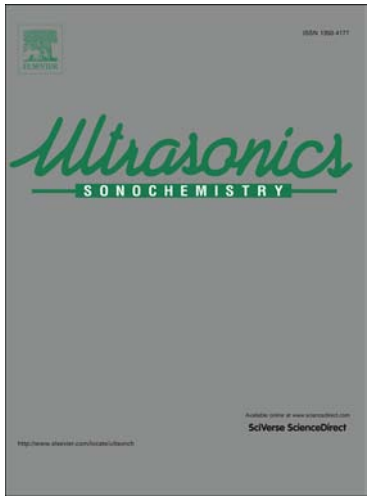

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Cheng Liu, Yakun Sun, Dongying Wang, Zhehao Sun, Ming Chen, Zhi Zhou, Wei Chen

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Performance and mechanism of low-frequency ultrasound to regenerate the biological activated carbon

Cheng Liu[a,b], Yakun Sun[b], Dongying Wang[b], Zhehao Sun[b], Ming Chen [c], Zhi Zhou[c], Wei Chen [a,b1]

[a]Key Laboratory of Integrated Regulation and Resource Development Shallow Lakes, Ministry of Education, Hohai University, Nanjing 210098, China

[b]College of Environment, Hohai University, Nanjing 210098, China

[c]Division of Environmental and Ecological Engineering, Purdue University, West Lafayette, IN 47907, USA

Abstract: Biological activated carbon (BAC) filter has been widely used as an effective water treatment but regenerations of BAC are costly. Ultrasound has been successfully applied for regeneration of activated carbon but has been less frequently applied to the regenerate the BAC. In this study, bench-scale and pilot-scale experiments were conducted to evaluate the regeneration performance and mechanism of BAC with low-frequency ultrasound. Adsorption indices, microbiological parameters, pore structure and removal efficiencies were further investigated. The results showed that low-frequency ultrasound could regenerate the BAC effectively. The regeneration effects were significantly affected by the frequency, sonication intensity, sonication time, and water temperature, but not the usage time of the BAC. The optimized conditions were identified as 40 kHz of frequency, 115×10^{-3}W/cm^3 of sonication intensity, 25-30□ of water temperature and 5 min of sonication time. The iodine value and methylene blue value increased from 480 mg/g and 100 mg/g to 680 mg/g and 133 mg/g respectively, the biomass decreased from 310 nmol P/gC to 245 nmol P/gC, while the biological activity increased from 0.03 mg O_2/h·gC to 0.0355 mg O_2/h·gC under the optimized condition. After three months of continuous operation, removal efficiencies of regenerated BAC were still high for the removal of organic contaminants, atrazine, and 2-MIB. Analysis of pore structure, BET surface area, and scanning electron microscopy indicated that ultrasound mainly acted on surface and macro-pores of BAC through the high-speed microjets and high-pressure

[1] Corresponding author: Wei Chen, Tel: +86 18913959968; fax: +86 25 83787618. Email address: liucheng8791@sina.com (W. Chen)。