Environmental Engineering and Management Journal

October 2011, Vol.10, No. 10, 1425-1432
http://omicron.ch.tuiasi.ro/EEMJ/

"Gheorghe Asachi" Technical University of Iasi, Romania

STUDIES ON ADSORPTION AND BIODEGRADATION OF CHROMIUM-CONTAINING WASTEWATER BY LABORATORY-SCALE SEQUENCING BATCH REACTOR-POWDERED ACTIVATED CARBON SYSTEM

Soon-An Ong[1, 2*], Eiichi Toorisaka[1], Makoto Hirata[1], Tadashi Hano[1]

[1]Department of Applied Chemistry, Oita University, Oita 870-1192, Japan
[2]School of Environmental Engineering, University Malaysia Perlis, 02600 Arau, Perlis, Malaysia

Abstract

The study involved investigating the effects of Cr(III) and the efficacy of powdered activated carbon (PAC) in reducing the inhibitory effects of Cr(III) on activated sludge under sequencing batch reactor (SBR) operation. The addition of Cr(III) into SBR system caused significant inhibitory effects on the activity of activated sludge as indicated by drastic drop in specific oxygen uptake rate (SOUR). The increase of Cr(III) concentration from 5 to 10 mg/L further deteriorated the treatment performance of SBR system in terms of the total organic carbon (TOC), suspended solids (SS) and Cr(III) removal efficiencies. With 0.167 g/L PAC (0.5 g PAC/cycle) addition into the SBR reactor influent wastewater, the TOC and Cr(III) removal efficiencies were improved from 88 to 94 % and 82 to 90 %, respectively. Coupled with the increasing mixed liquor biomass suspended solids concentration after PAC addition, the biomass apparently played the key role in the uptake of Cr(III) and kept the effluent Cr(III) concentration low. The addition of PAC was an effective way to allow continuous operation of the biological process in the presence of Cr(III) as indicated by increased SOUR as well as Cr(III) and TOC removal efficiencies.

Key words: chromium, dissolved oxygen, sequencing batch reactor, specific oxygen uptake rate, toxic effect

Received: January, 2011; Revised final: March, 2011; Accepted: March, 2011

* Author to whom all correspondence should be addressed: e-mail: ongsoonan@yahoo.com