*Environmental Engineering and Management Journal* *July 2013, Vol.12, No. 7, 1429-1436*
*http://omicron.ch.tuiasi.ro/EEMJ/*

*"Gheorghe Asachi" Technical University of Iasi, Romania*


# EFFECTS OF COD:SULFATE RATIO ON SULFATE REMOVAL FROM OIL SHALE RETORT WATER USING MICROBIAL FUEL CELLS

**Ho Il Park, Lian-Shin Lin***

*West Virginia University, Department of Civil and Environmental Engineering, Morgantown, WV 26506, USA*

## Abstract

This paper reports the effects of COD:sulfate ratio on sulfate removal and electricity generation from oil shale retort water treatment using microbial fuel cells (MFCs). Field-collected retort water was augmented with organics to obtain a range of initial COD:$SO_4^{2-}$ ratios (0.5:1 to 2:1), and treated in two different MFC designs (tubular and two-chambered). The two-chambered MFCs exhibited COD and sulfate removal 1 to 2 orders of magnitude higher than those of the tubular MFCs. The tubular MFCs did not exhibit a significant dependence of sulfate removal on the COD:$SO_4^{2-}$ ratio while the two-chambered MFCs showed a positive trend. The tubular MFCs generated a maximum power density of 19 mW/$m^2$ (COD:$SO_4^{2-}$ = 1.5:1), and the two-chambered MFCs produced 120 mW/$m^2$ (2:1). The results suggest that organic carbon loading to the MFCs should be determined based on the sulfate concentration and reactor design to achieve optimal sulfate removal and electric power output.

*Key words:* COD:sulfate ratio, microbial fuel cells, oil shale retort water, sulfate removal

*Received: November 2012; Revised final: May, 2013; Accepted: June 2013*

* Author to whom all correspondence should be addressed: E-mail: lianshin.lin@mail.wvu.edu; Phone: +2 048 2221549; Fax: +2 048 2235695