



Effect of general ions on biological treatment of perchlorates in smelting wastewater

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ABSTRACT

The objective of this work was to investigate SO_4^{2-} -, Cl^- -, and CO_3^{2-} - ions interference on the effectiveness of perchlorate removal from smelting wastewaters in order to select adaptive biotechnological solutions. Ion chromatography using the EPA method 314.0 was utilized for the perchlorate determination. The precision, the method detection limits (MDL), and the minimum reporting level (MRL) of the analytical method were critically examined. In spite of the strong inhibitory effects of the dissolved inorganic substances contained in smelting wastewater, microbes could cope with their relatively high concentration allowing the subsequent biological treatment to reduce effectively the perchlorates concentration to a satisfactory level. The increase of the SO_4^{2-} -concentration from 0 to 16,000 ppm (conductivity: 428 \rightarrow 24,800 $\mu\text{S}/\text{cm}$) led to a reduction of the perchlorates biodegradation rate by approximately 10 times from 0.0365/h to 0.0033/h. However, most of the perchlorates were removed after a hydraulic retention time (HRT) of half a day with mixed liquor volatile suspended solid (MLVSS) of 2000–3000 ppm. The introduction to the bioreactor of influent containing a SO_4^{2-} -concentration of 20,000 ppm (conductivity: 30,100 $\mu\text{S}/\text{cm}$) resulted in almost complete removal of perchlorates below the detection limit for a short period of time. The persistence of this condition, however, seriously inhibited the microbial activity.

Keywords: Perchlorate; Zinc smelting; Conductivity; Biological treatment; Percent difference; Distortion

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