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"Gheorghe Asachi" Technical University of Iasi, Romania

TREATMENT OF MUNICIPAL WASTEWATER WITH CALCIUM PHOSPHATE: A NEW PHYSICOCHEMICAL PURIFICATION STEP

Nathalie Lyczko[1]*, Haroun Sebei[1], Ange Nzihou[1], Patrick Sharrock[1,2]

[1]Université de Toulouse, Mines Albi, CNRS, Centre RAPSODEE, Campus Jarlard, F-81013 Albi cedex 09, France
[2]Université de Toulouse, SIMAD, IUT de Castres, av. Pompidou, Castres 81104, France

Abstract

An apatitic calcium phosphate gel (HaG) was elaborated and used to treat municipal wastewater in a physicochemical cycle prior to the standard biological degradation process. Preliminary laboratory batch experiments outlined the kinetics of heavy metal sorption by monitoring the concentrations found in filtered fractions as a function of treatment time. On site experiments were performed in a municipal wastewater treatment plant by derivation of real wastewater into an experimental tank. In this case, the sorption of organic and metal pollution was studied on the whole effluent. The solid and liquid phases were both characterized using elemental analysis, total and organic carbon, and thermal analysis of the solids collected. Results showed significant reductions in heavy metal contents of about 50 to 60% for main metals such as lead, aluminum and iron in the liquid phase. The concentrations went respectively from initial values of 0.07, 0.15 and 1.80 ppm to 0.04, 0.11 and 0.03 ppm in the treated waters for these elements. Organic matter also reacted with the HaG by adsorbing to the solid particles, with the contents of organic carbon increasing from zero to 80 g/Kg on the solids and decreasing from 130 ppm to 24 ppm in the liquid phase. This allows foreseeing improvements in the biological treatment process following this physicochemical purification step. The elemental analysis showed that up to 50 and 90 percent of the heavy metals could be removed from the effluent. The presence of the organic matter adsorbed on calcium phosphate was confirmed by thermal methods.

Keywords: calcium phosphate, heavy metals, organics, wastewater treatment

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* Author to whom all correspondence should be addressed: e-mail: lyczko@mines-albi.fr; Phone: +33 5 63 49 31 22; Fax : +33 5 63 49 32 43