Mineralisation of olive mill wastewater over DSAs

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Abstract

Bioenergy recovery from olive mill wastewater (OMW) has been effectively accomplished by anaerobic digestion [1]. Nevertheless, a post treatment is required to attain the discharge limit values. After the anaerobic treatment of OMW, the main issues are related to the remaining organic matter (COD), recalcitrant phenolic compounds (40-50%) and effluent dark-brown colour.

The electrochemical treatment is proposed in this work as a final step to mineralise the OMW non-biodegradable fraction. The electrochemical oxidation of OMW anaerobically digested was investigated over DSAs. The performance of RuO_2 and IrO_2 based DSAs was studied by cyclic voltammetry and bulk electrolysis. The experiments were carried out with alkaline samples from the anaerobic reactor comprising 1 to 10 g COD/L, depending to the digester operational conditions. KNO_3 was used as electrolyte, alternatively to the preferred NaCl [2], to avoid obtaining an effluent with higher toxicity than the initial one.

It was found that RuO_2 based anode was significantly more efficient than IrO_2, mainly for the COD removal (Figure 1). With an electrolysis charge of Q=1517 C it was obtained COD removals of 9 and 52%, phenols removals of 72 and 98% and colour removal of 61 and 98%, for IrO_2 and RuO_2 type DSAs, respectively. The exclusion of the centrifugation/filtration step before the electrochemical treatment was considered, since the anaerobic treatment step reduces considerably the solids fraction.

It is concluded that the electrochemical oxidation over DSAs is a suitable second step treatment for OMW disposal after the recovery of its energetic potential. The outcome energy from biogas production can balance or reduce the costs of the electrochemical treatment.

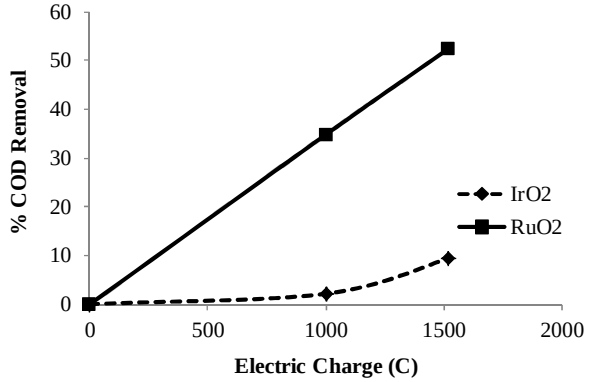

Figure 1- COD removal (%) as function of the charge passed during the electrolysis (C). Electrooxidation of the effluent from the anaerobic reactor treating OMW at -1.8 V vs Ag/AgCl, using RuO_2 and IrO_2 based DSAs

References

[1] M. R. Gonçalves, P. Freitas, I.P. Marques, Biomass and Bioenerg. (submitted).

[2] M. Gotsi, N. Kalogerakis, E. Psillakis, P. Samaras, D. Mantzavinos, Water Res. 39 (2005) 4177.