

Poster

Effect of FeCl₃ fixed on silica-gel as catalyst on olives and olive-oil washing wastewaters treatment by photo-Fenton



Gassan Hodaifa and Manuel Rodríguez Pecino

Department of Molecular Biology and Biochemical Engineering, Chemical Engineering Area, University of Pablo de Olivade, ES-41013 Seville, Spain. Corresponding author: G. Hodaifa, E-mail: ghodaifa@upo.es

Keywords: Olive-oil mill wastewater; PhotoFenton; UV light; Heterogeneous catalysis, FeCl₃ fixed on silica-gel.

ABSTRACT

Motivation: The high production of olive oil in Spain generates a large amount of wastewaters from washing of olives and oil which are currently stored in accumulation rafts for its evaporation. These wastewaters (OMWs) are an environmental problem because they have high organic load with inhibitory compounds as phenols. In this work, photo-Fenton reaction (chemical oxidation) has been used for OMWs treatment. Solid catalyst "FeCl₃ fixed on silica-gel" has been used on the photo-Fenton reaction to test its effectiveness on the treatment of OMWs.

Methods: In all experiments crude OMW (mixed of olives and olive-oil washing wastewaters) with initial COD 16500 g O₂/L and TOC = 4942 mg/L are used. In all cases reactor capacity was 1 L. The development of the photo-Fenton experiments was carried out using a FeCl₃ fixed on silica-gel as catalyst. Different catalyst concentrations (0.01, 0.1, 0.5, 5, 20 and 25 g/L) are tests. Common operating conditions are: [H₂O₂] = 0.024 g/L, T = 20°C, pH = 3, and artificial UV-light. During experiments the quality of treated water was determined by measuring total carbon "TC", total organic carbon "TOC", total nitrogen "TN", chemical oxygen demand "COD", total phenol compounds "TFCs", total iron, turbidity and electrical conductivity. Control experiment has been carried in the same operating conditions but without iron catalyst.

Results: In all experiments, the percentages of organic load removal by photo-Fenton reaction (CODremoval = 48.3-73.5%, TOCremoval = 40.1-87.5%, TFCsremoval = 82.6-93.5% and turbidityremoval = 87.8-93.6%) were determined.

Conclusions: The use of photo-Fenton shows high efficiency in the treatment of the olive oil mill wastewater. The photodegradation using the system of UV/H₂O₂ has a similar results to that obtained by UV/FeCl₃/H₂O₂ system when use 0.01 g/L as catalyst.

REFERENCES

- Nickheslat A., Mehdi Amin M. , Izanloo H., Fatehizadeh A., and Mousa S.M. (2013)Phenol photocatalytic degradation by advanced oxidation process under ultraviolet Radiation. Journal of Environmental and Public Health.
- Hanafi F, Belaoufi A, Mountadar M, Assobhei O. (2011) Augmentation of biodegradability of olive mill wastewater by electrochemical pre-treatment: Effect on phytotoxicity and operating cost. J Hazard Mater. 190(1):94-99. doi:10.1016/j.jhazmat.2011.02.087.
- Martinez Nieto L., Hodaifa G.(2007) Depuración de las aguas de lavado de aceite y aceitunas por oxidación química a escala piloto industrial.I Congreso Cultura del Olivo. 635-645.
- Sekine M. , Salehi Z. , Tokumura M. , Kawase Y (2012) Solar photo-Fenton process for the treatment of colored soft drink wastewater: Decolorizati, Journal of Environmental Science and Health. Part A. 47 , 2181–2189.