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Micro-scale wastewater treatment using microalgal bacterial flocs entrapped in gelling matrix of PVA-alginate

Olfa Beji[1,2], Nouceiba Adouani[1], Souhila Poncin[1], Moktar Hamdi[2] and **Huai Zhi Li[1]**
[1]University of Lorraine, France
[2]University of Carthage, Tunisia

Microalgal bacterial flocs (MaB-flocs) immobilization technique using PVA (polyvinyl alcohol) crosslink with sodium sulfate represents a novel approach to wastewater treatment. This new technique can simultaneously eliminate the agglomeration and swelling problem of the PVA-boric acid method. In this approach, the PVA-sulfate method may be a promising and economical technique for cell immobilization, and entrapped MaB-flocs could separate the treated wastewater from the produced biomass. The present work aims at developing an original microscale approach to investigate various phenomena and then to intensify the performance of an anaerobic multiphase bioreactor. The experiments were carried out respectively in a 1D anaerobic microreactor to effectively treat the synthetic wastewater prepared with two different initial COD 200 mg/L and 450 mg/L solutions. Sunlight exposure promoted the growth of microalgae in the microreactor forming an algal–bacterial symbiosis in PVA-sulfate beads. Three different MaB-flocs concentrations C_1:2%, C_2:5%, C_3:10% were used in PVA entrapment processes. The feasibility of this PVA-alginate formulation for cells immobilization was investigated by checking the survival of the microalgal bacterial flocs after immobilization process and chemical oxygen demand (COD) removal performance of anaerobic reactor efficiency for microscale synthetic wastewater treatment. In addition, the microscopy analysis techniques offer an opportunity to observe and quantify the growth of microalgal bacterial flocs at microscale on a single PVA bead. This treatment with MaB-flocs PVA beads resulted in significantly COD removal rates among wastewaters. The COD removal performance of the anaerobic microreactor achieved 63% after 6 days of treatment, suggesting the high concentration of MaB-flocs C_3:10% have good potential for organics removal. A high MaB-floc production was obtained respectively with a 200 mg/L effluent. These results may contribute to evolving immobilized MaB-floc as a valuable remediation strategy for wastewater treatment.

olfa.beji@univ-lorraine.fr

Measuring contagion between energy and stock market during financial crisis: Asymmetric dynamics in the correlations

Nadhem Selmi
University of Sfax, Tunisia

This paper deals with the study of the Asymmetric Dynamic Conditional Correlation (ADCC) model developed by Cappiello et al. (2006). The A-DCC models carry out better than the non-asymmetric ones. The methodological design is an appropriate multivariate vector and autoregressive exponential GARCH (M-VAR-EGARCH) process which investigate the nature of the volatility and return spillover mechanism across markets. This article examines the dynamic linkages between the stock market and oil price in the US and the Euro-Zone from January 2, 2004 to July 5, 2013. The findings support the existence of a contagion effect during the Greek debt crisis but not the subprime crisis.

nadhem.selmi@yahoo.fr