World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:8, No:01, 2014

Microbubbles Enhanced Synthetic Phorbol Ester Degradation by Ozonolysis

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Abstract : A phorbol-12-myristate-13-acetate (TPA) is a synthetic analogue of phorbol ester (PE), a natural toxic compound of Euphorbiaceae plant. The oil extracted from plants of this family is useful source for primarily biofuel. However this oil can also be used as a food stock due to its significant nutrition content. The limitations for utilizing the oil as a food stock are mainly due to a toxicity of PE. Nowadays a majority of PE detoxification processes are expensive as include multi steps alcohol extraction sequence. Ozone is considered as a strong oxidative agent. It reaction with PE it attacks the carbon double bond of PE. This modification of PE molecular structure results into nontoxic ester with high lipid content. This report presents data on development of simple and cheap PE detoxification process with water application as a buffer and ozone as reactive component. The core of this new technique is a simultaneous application of new microscale plasma unit for ozone production and patented gas oscillation technology. In combination with a reactor design the technology permits ozone injection to the water-TPA mixture in form of microbubbles. The efficacy of a heterogeneous process depends on diffusion coefficient which can be controlled by contact time and interface area. The low velocity of rising microbubbles and high surface to volume ratio allow fast mass transfer to be achieved during the process. Direct injection of ozone is the most efficient process for a highly reactive and short lived chemical. Data on the plasma unit behavior are presented and influence of the gas oscillation technology to the microbubbles production mechanism has been discussed. Data on overall process efficacy for TPA degradation is shown.

Keywords : microbubble, ozonolysis, synthetic phorbol ester, chemical engineering
Conference Title : ICCEPT 2014 : International Conference on Chemical Engineering and Process Technology
Conference Location : Istanbul, Türkiye
Conference Dates : January 27-28, 2014