World Academy of Science, Engineering and Technology
International Journal of Chemical and Molecular Engineering
Vol:8, No:1, 2014

Efficient Compact Micro Dielectric Barrier Discharge (DBD) Plasma Reactor for Ozone Generation for Industrial Application in Liquid and Gas Phase Systems

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Abstract : Ozone is well known as a powerful fast reaction rate oxidant. The ozone based processes produce no by-product left as a non-reacted ozone returns back to the original oxygen molecule. Therefore an application of ozone is widely accepted as one of the main directions for a sustainable and clean technologies development. There are number of technologies require ozone to be delivered to specific points of a production network or reactors construction. Due to space constrains, high reactivity and short life time of ozone the use of ozone generators even of a bench top scale is practically limited. This requires development of mini/micro scale ozone generator which can be directly incorporated into production units. Our report presents a feasibility study of a new micro scale rector for ozone generation (MROG). Data on MROG calibration and indigo decomposition at different operation conditions are presented. At selected operation conditions with residence time of 0.25 s the process of ozone generation is not limited by reaction rate and the amount of ozone produced is a function of power applied. It was shown that the MROG is capable to produce ozone at voltage level starting from 3.5kV with ozone concentration of 5.28E-6 (mol/L) at 5kV. This is in line with data presented on numerical investigation for a MROG. It was shown that in compare to a conventional ozone generator, MROG has lower power consumption at low voltages and atmospheric pressure. The MROG construction makes it applicable for emerged and dry systems. With a robust compact design MROG can be used as incorporated unit for production lines of high complexity.

Keywords : dielectric barrier discharge (DBD), micro reactor, ozone, plasma
Conference Title : ICCEPT 2014 : International Conference on Chemical Engineering and Process Technology
Conference Location : Istanbul, Turkey
Conference Dates : January 27-28, 2014