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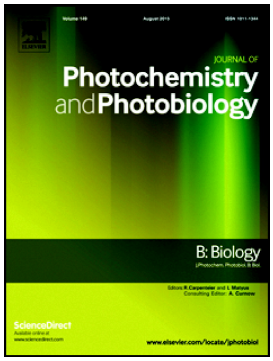

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Joanne Mac Mahon, Suresh C. Pillai, John M. Kelly, Laurence W. Gill

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Solar photocatalytic disinfection of *E. coli* and bacteriophages MS2, ΦX174 and PR772 using TiO_2, ZnO and Ruthenium based complexes in a continuous flow system

Joanne Mac Mahon [1.], Suresh C. Pillai [2.,3.], John M. Kelly [4.], Laurence W. Gill [1.]

[1.] Department of Civil, Structural and Environmental Engineering, Museum Building, Trinity College Dublin, College Green, Dublin 2, Ireland.

[2.] Centre for Precision Engineering, Materials and Manufacturing Research (PEM), Institute of Technology, Sligo, Ireland.

[3.] Nanotechnology and Bio-Engineering Research Group, Department of Environmental Science, Institute of Technology Sligo, Ireland.

[4.] School of Chemistry, Trinity College Dublin, College Green, Dublin 2, Ireland.

(email: macmahoj@tcd.ie; laurence.gill@tcd.ie)

Abstract

The performance of photocatalytic treatment processes were assessed using different photocatalysts against *E. coli* and bacteriophages MS2, ΦX174 and PR772, in a recirculating continuous flow compound parabolic collector system under real sunlight conditions. Suspended TiO_2 and ZnO nanoparticle powders and Tris(2,2′-bipyridyl)dichlororuthenium(II) hexahydrate in solution were tested separately, as well as in combination, using *E. coli*. For a 3-log reduction of *E. coli* in distilled water, inactivation rates in terms of cumulative dose were in the order $Ru(bpy)_3Cl_2$ > (TiO_2 & $Ru(bpy)_3Cl_2$) > (ZnO & $Ru(bpy)_3Cl_2$) > ZnO > TiO_2 > photolysis. Reactivation of *E. coli* was observed following all trials despite the detection limit being reached, although the reactivated colonies were observed to be under stress and much slower growing when compared to original colonies. Treatment with $Ru(bpy)_3Cl_2$ was also compared against standard photolysis of bacteriophages MS2, ΦX174 and PR772 with the order of photolytic inactivation for a 3-log reduction in terms of cumulative UV-A dose being ΦX174 > PR772 > MS2. However, MS2 was found to be the most susceptible bacteriophage to treatment with $Ru(bpy)_3Cl_2$, with complete removal of the phage observed within the first