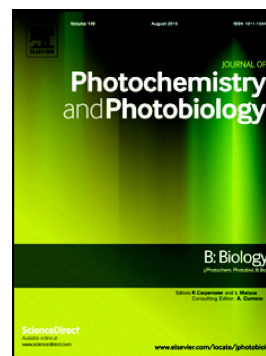


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Solar photocatalytic disinfection of *E. coli* and bacteriophages MS2, Φ X174 and PR772 using TiO₂, ZnO and Ruthenium based complexes in a continuous flow system

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Abstract

The performance of photocatalytic treatment processes were assessed using different photocatalysts against *E. coli* and bacteriophages MS2, Φ X174 and PR772, in a recirculating continuous flow compound parabolic collector system under real sunlight conditions. Suspended TiO₂ 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)₃Cl₂ > (TiO₂ & Ru(bpy)₃Cl₂) > (ZnO & Ru(bpy)₃Cl₂) > ZnO > TiO₂ > 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)₃Cl₂ was also compared against standard photolysis of bacteriophages MS2, Φ X174 and PR772 with the order of photolytic inactivation for a 3-log reduction in terms of cumulative UV-A dose being Φ X174 > PR772 > MS2. However, MS2 was found to be the most susceptible bacteriophage to treatment with Ru(bpy)₃Cl₂, with complete removal of the phage observed within the first

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