Photocatalytic inactivation of pathogenic bacteria using polyoxometalates

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Abstract

Polyoxometalates (POMs) as a homogeneous photocatalyst and semiconductor oxide TiO_2 as a heterogeneous photocatalyst share many aspects of similarity in their operating mechanisms[1-3]. In this study, we compared photocatalytic inactivation of pathogenic *E. coli* using POM and TiO_2 in aqueous solution. Almost all the initial *E. coli* (5×10^7 cell/ml) were inactivted with 40 min in the presence of both POM and TiO_2, but the POM-mediated inactivation was faster than that with TiO_2 under the experimental conditions employed in this study. Photocatalytic inactivation of *E. coli* was more efficient by free $H_4O_{40}SiW_{12}$ or $Mo_{12}O_{40}P$ than by TiO_2. Kinetic studies using *tert*-butyl alcohol or methanol as an OH radical scavenger suggested that OH radicals are dominant photooxidant in photocatalyst inactivation[3-4]. In particular, the biocidal action of the photocatalyst has been accepted that reactive oxygen species (ROS) and OH radicals play the role[4].

References

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