

Application of Bacteriophage and Essential Oil to Enhance Photocatalytic Efficiency

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Abstract : This present study suggests the use of biological and natural bactericide, cheap, safe to handle, natural, environmentally benign agents to enhance the conventional wastewater treatment process. In the same sense, to highlight the enhancement of wastewater photocatalytic treatability, we were used virulent bacteriophage(s) and essential oils (EOs). The pre-phago-treatment of wastewater with lytic phage(s), leads to a decrease in bacterial density and, consequently, limits the establishment of intercellular communication (QS), thus preventing biofilm formation and inhibiting the expression of other virulence factors after photocatalysis. Moreover, to increase the photocatalytic efficiency, we were added to the secondary treated wastewater 1/1000 (w/v) of EO of thyme (*T. vulgaris*). This EO showed in vitro an anti-biofilm activity through the inhibition of planktonic cell mobility and their attachment on an inert surface and also the deterioration of the sessile structure. The presence of photoactivatable molecules (photosensitizers) in this type of oil allows the optimization of photocatalytic efficiency without hazards related to dyes and chemicals reagent. The use of 'biological and natural tools' in combination with usual water treatment process can be considered as a safety procedure to reduce and/or to prevent the recontamination of treated water and also to prevent the re-expression of virulent factors by pathogenic bacteria such as biofilm formation with friendly processes.

Keywords : biofilm, essential oil, optimization, phage, photocatalysis, wastewater

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