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Investigation of water disinfection efficiency using titanium dioxide (TiO_2) in permeable to sunlight tubes

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ABSTRACT

In this study, photocatalytic-solar disinfection using immobilized layer of TiO_2 in the polyethylene tube, which transmits solar UV from itself , is investigated. The aim of this research is surveying the efficiency of these tubes in water disinfection instead of chlorination method supplying drinking water for small communities. Index of coliform was considered as contamination index. This research was based on pilot studies that consist of three tubes. The first one was a polyethylene light-transmitter tube with an interior coating of immobilized TiO_2. Second tube was similar to first tube and had not any TiO_2 coating. Third tube was an ordinary polyethylene tube without light-penetrability coated by TiO_2 layer. At first decomposition of colour solution of methyl orange was investigated. The initial concentration of methyl orange was 4 ppm. Water retention times in tubes were 120, 240 min. For the effect of sunlight intensity, tests were implemented in midday from 11:00 to 15:00. Tests results showed that in the first tube inactivation of the coliforms was 99.01%. The influence of temperature on system's efficiency was obvious. The 4 ppm concentration of methyl orange became less than 0.2 ppm in 12 d.

Keywords: Photocatalytic disinfection; Polyethylene light-transmitter tube; Coliform; Solar UV; Methyl orange

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