

REMOVAL OF MICROCYSTIN-LR FROM DRINKING WATER USING NATURAL RUTILE SAND

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Presence of cyanotoxins in water bodies, which are utilized for human consumption, is a major constraint in providing safe potable water in Sri Lanka. Present study was carried out to evaluate the potential use of natural rutile sand as a photocatalytic agent to remove Microcystin-LR (MC-LR) toxin from drinking water. Though several studies have been published on the photocatalytic effects of rutile and titanium dioxide on removal of organic molecules, this is the first report on the usage of natural rutile sand for removal of Microcystin-LR in Sri Lanka. Rutile sand was collected from the mineral sand deposit of Pulmoddai, Eastern Province and MC-LR toxin was extracted from the water samples collected from Beira lake, Colombo.

The photocatalytic activity of natural rutile sand was induced by providing Ultra Violet (UV) illumination (12 W, 365 nm). In vitro laboratory experiments were carried out to assess the photocatalytic ability of natural rutile sand on MC-LR. Water samples which were injected with known concentrations of MC-LR, were exposed to the photocatalytic process of natural rutile sand for a determined time and then were subjected to HPLC analysis to detect possible reduction in concentration. The results revealed the potential photocatalytic degradation of MC-LR by natural rutile sand. The MC-LR removal efficiency of natural rutile sand was compared with pure Titanium dioxide (TiO₂). The results showed that degradation rates of MC-LR by natural rutile was 50%, whereas pure granular and powder TiO₂ showed 63% and 78% degradation of MC-LR respectively. When MC-LR was exposed to only UV light treatment, 22% of reduction was detected. Based on the results obtained, a filter model was designed using natural rutile sand to evaluate the potential use of natural rutile sand to remove MC-LR. The constructed filter model showed 24%, 38%, 49% and 53% removal of MC-LR after 60, 120, 180 and 240 minutes, at a water circulation rate of 500 L h⁻¹.

The study showed that there is a potential of utilizing natural rutile sand to remove hazardous MC-LR from water and the research will help to improve drinking water treatment facilities in Sri Lanka.

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