P-46: Effect of ultrasound on cyanobacteria in water

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Cyanobacteria are photosynthetic bacteria with some characteristics of cyanobacteria. When the concentration of cyanobacteria reaches high levels it is referred to as a cyanobacteria bloom. Cyanobacteria blooms can produce toxins that have been shown to be hazardous to animals and humans as well as progressive macrophyte decline and fish kills, blockage of filtration systems, increasing cost of water treatment and odour problems. There are a number of approaches available to control cyanobacteria blooms such as minimizing nutrient loading (nitrogen and phosphorus), addition of algaecides, aeration or artificial mixing, filters with activated carbon (GAC) and barley straw. Although these methods of control are widely practiced they have not proved effective for cyanobacteria control (NAR, 1990). Ultrasound is a relatively new method to control cyanobacteria bloom. From a literature review of papers on the ultrasonic removal of cyanobacterial, there are certain main parameters that appear important such as intensity (14 -100 W), frequency (20 kHz - 1.7 MHz), and sonication time (seconds/hours). Problems of controlling cyanobacterial bloom using ultrasound include the fact that there are really no certain established parameter settings (intensity, frequency, temperature & sonication time), no clear understanding of basic mechanism and evaluation of potential for cyanobacterial cells injury and little knowledge of the expense in terms of energy costing for large-scale application. In Sonochemistry Centre of Coventry University, we are assessing the effect of ultrasound on cyanobacteria (*Microcystis aeruginosa*) removal/inactivation under the following parameters (volume, intensity, frequency & sonication time) at small/middle scale experiments to determine the optimum parameter settings, according to cyanobacteria removal rate and the energy-costing (Intensity or W/cm^3) and to gain understanding of basic mechanism and evaluation of potential for cyanobacterial cells injury. Cyanobacteria cells are counted using haemocytometer and chlorophyll A concentration was measured using a spectrometer (Corning 253) and UV-Vis spectrometer (Shimadzu, 2450PC) at wavelength scale 360nm-800nm together with a fluorimeter (Shimazu, RF5301) at emission wavelength 465nm. Cyanobacterial cell activity was analysis using a flow cytometer (BD FACSCablibur). Haemocytometry and flow cytometry results correlate well, indicating ultrasound damages cyanobacteria cells during treatment.

Both small and medium pilot scale ultrasonic treatment demonstrated an inactivation effect with ultrasonic treatment. Therefore, ultrasonic irradiation may provide a suitable method for cyanobacterial bloom control in large scale applications.

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