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EFFICIENCY ENHANCEMENTS THROUGH THE USE OF MAGNETIC FIELD GRADIENT IN ORIENTATION MAGNETIC SEPARATION FOR THE REMOVAL OF POLLUTANTS BY MAGNETOTACTIC BACTERIA

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Abstract

Orientation magnetic separation (OMS) represents a simple method that permits motile, field-susceptible magnetotactic bacteria (MTB) to be separated from water. Such an approach can be used to decontaminate polluted water through uptake of contaminants by the bacteria and their subsequent removal by the application of magnetic fields. In OMS, a separation channel through which an MTB culture is flowing is subjected to a magnetic field perpendicular to the flow direction. The bacteria “sense” the magnetic field, orientating themselves parallel to the field lines and then swim to the channel sides where they accumulate. The fluid flow through such a

standard separation channel has been shown to cause dislodgement of accumulated bacteria. To reduce this effect, a new approach has been developed utilizing magnetic gradients to retain the bacteria at the walls of the separator. A study comparing the operation of a standard channel separator with three new designs containing nickel wire matrices has been carried out. The resultant separation efficiencies and the effect on separation of varying both the flow rate and the applied magnetic field are described. The new separators enhance the separation efficiency by up to 300% over the standard separator.

Keywords:

Biomagnetism | Orientation magnetic separation | Magnetotactic bacteria

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