Effect of immobilization of cells and/or presence of cyclodextrin on biodegradation of hydrophobic compounds

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Nowadays, the appearance of unctuous contamination in the environment is still a serious problem. The insolubility of these compounds in water is a limiting factor for their degradability. Several microbes can produce surfactants providing an easier way for solubilizing hydrophobic organic substrates. One of the most famous group of microorganisms synthesizing these surfactants is the *Rhodococcus* genus. These surfactant might be extracellular or bound to the membrane.

If continuous bioreactor is used for bioremediation of the pollutants, the cells should be immobilized to avoid of their washing out and/or to protect cells from external effects. However, the immobilization of cells might have a negative effect during hydrocarbon degradation, when cells have cell wall-bound surfactants. If cells are immobilized, the cell wall-bound surfactants are unable to interact with the hydrophobic components floating on water surface, therefore, there was a significant decrease in the efficiency and speed of hydrocarbon degradation as compared to cells producing extracellular surfactants.

The aim of this work was to compare the hydrocarbon degrading efficiency of free and immobilized cells. Two *Rhodococcus erythropolis* strains (one having wall-bound and another one producing free surfactant) were used.

The biodegradation efficiacy was greatly affected by the properties of the surfactants. The cell immobilization did not effect the hydrocarbon degrading capacity of the *R. erythropolis* PR4 strain having extracellular surfactants, however a significant decrease could be observed in the activity of the *R. erythropolis* MK1 having cell wall-bound surfactant. In case of hydrophilic substrate, a quicker adaptation was shown at *R. erythropolis* MK1 using either immobilized and free-floating cells.

Cyclodextrin was applied for the enhancing the bioavailability of cells to the hydrophobic molecules. The addition of cyclodextrin to the *R. erythropolis* MK1 culture stimulated the bioconversion rate, which effect could not be observed for the *R. erythropolis* PR4.

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