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MICROFLUIDIC DEVICES FOR THE ASSESSMENT OF THE PAHs REMOVAL CAPACITY BY BACTERIAL BIOFILMS

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Microfluidics is the study and manipulation of fluids in micrometer scale structures. It provides promising systems for lab-on-a-chip (LOC) applications. LOC offers faster, parallel, and high throughput (bio) chemical analysis and screening on miniaturized systems with several advantages such as reductions in sample volumes and manufacturing cost. The LOC application for the study of organisms is an emerging field, where miniaturization system benefits offer a precise spatiotemporal control over the microenvironments of soil organisms with approximation of natural conditions. The aim of our work is to propose the microfluidic device as a platform to study the capacity of PAH degradation by bacterial biofilms. The microdevices were built with glass base and PDMS cover. PDMS was mixed with curing agent in a 10:1 ratio and then the mixture was placed under vacuum to remove air bubbles, poured onto the SU8-mold and cured in an oven at 80 °C overnight. The microchip consists of an input and an output connected with four microchannels of 496 mm wide with 4 cisterns in each of 1690 mm in width and a total internal volume of 32.22 mL. The microchannels were washed with ethanol 70% and it were desinfected using NaOH 0.5 mol.L-1 for 30 minutes. For biofilm formation on the microchannels, a continuous culture of the bacterial strain *Pseudomonas monteilii* P26 was carried out using the microchip as the bioreactor. After 3 days of culture, good cell adhesion to the substrate and biofilm formation inside the microchannels were observed. After, a PAH suspension containing 50 ppm of a mix of acenaphthene, fluoranthene and pyrene was pumped through the microchip in a closed loop at room temperature for 4 days. After this time, the remaining PAH in the system was solubilized with acetone and quantified by RT-HPLC. Results showed 79.2%, 56.2% and 55.0% removal of acenaphthene, fluoranthene and pyrene, respectively. For comparison, a culture of planktonic cells of *P. monteilii* P26 was incubated in presence of the same PAHs concentration for 30 days. This culture was able to remove 76.96% acenaphthene but no significant removal of fluoranthene and pyrene was observed. Our results have shown that using the microchip as culture system improved the PAH removal capacity of *P. monteilii* P26. This microfluidic device has proved to be a valuable tool for quickly screening of PAH removal capacity by biofilms.