BIOREMEDIATION OF CONTAMINATED SOIL FROM CRUDE OIL WITH BACILLUS CEREUS BACTERIA ON SLURRY BIOREACTOR

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Abstract

Exploration and production of crude oil potentially polluted the environment. One way to overcome petroleum contamination was by bioremediation method, which used microorganisms to degrade hazardous compounds to be harmless. This research aimed to study the effect of bacillus cereus bacteria concentration in reducing concentrations of TPH (Total Petroleum Hydrocarbon) in bioremediation of petroleum contaminated soil. The research method used three main stages of rejuvenation of Bacillus cereus bacteria, soil preparation, and the process of bioremediation.

Residues of petroleum hydrocarbons were measured by gravimetric method. Process was indentified in seven-weeks, Bacillus cereus bacteria with a concentration of 5% (v/v), 10% (v/v), 15% (v/v) and without addition of bacteria, at initial showed TPH in soil were 51,000 µg/g; 49,000 µg/g; 50,000 µg/g and 46,000 µg/g, respectively and 7th week could be will reduced the levels of total petroleum hydrocarbons were a row is 15,000 µg/g; 7,000 µg/g; 7,000 µg/g and 27,000 µg/g, with the percent biodegradation 69.39%; 86%; 84.78% and 47.06%.

As for BTEX, the initial concentration for the compounds benzene, toluene, ethylbenzene and xylene is 33,228 mg/L; 39.787 mg/L; 9.009 mg/L and 12.147 mg/L. For BTEX concentrations at the end of the addition of bacteria 5% (v/v), for benzene is 0.635 mg/L, toluene was 20.067 mg/L, ethylbenzene is 1.428 mg/L and xylene is 0.469 mg/L. On the addition of bacteria 10% (v/v), for benzene is 0.565 mg/L, ethylbenzene is 0.649 mg/L and xylene is 0.459 mg/L. And the addition of bacteria 15% (v/v), for benzene is 0.496 mg/L, and xylene were 0.444 mg/L.

For kinetic parameters, the addition of bacteria 5% (v/v), kinetic model obtained Y = 1.745 mg biomass/mg substrate, k_d = 0.028 days^{-1}; k_o = -0.128 day^{-1} and K_m = 1745201 mg/L. For the bioreactor 10% (v/v) the value of Y = 1.634 mg biomass/mg substrate, k_d = 0.041 days^{-1}; k_o = 0.318 days^{-1} and K_m = 44501.6 mg/L. As for the bioreactor 15% obtained the value of Y = 2 mg biomass/mg substrate, k_d = 0.032 days^{-1}; k_o = 0.941 days^{-1} and K_m = 81 200 mg/L.

Keywords: bioremediation, crude oil, slurry bioreactor, bacillus cereus, and total petroleum hydrocarbons.