Effect of Physicochemical Parameters on Screening Characteristics of Suspension in Bioremediation Sampling

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Abstract

The research demonstrates the significance of some physicochemical parameters on the screening characteristics of suspension in bioremediation sampling. In this investigation, physicochemical parameters of soil sample polluted with crude oil was subjected into sampling by considering the total phosphorus, nitrogen and pH concentration at initial, intermediate and final stage upon the influence of the period of exposure as well as the average values were determined mathematically. The mathematical tools of matrix was formulated from the obtained data and resolved using the mathematical techniques known as matlab (Matrix Laboratory) computer programme language. The results obtained revealed the influence of physicochemical parameters as well as the microbial concentration on increasing the screening characteristics of suspension in bioremediation during sampling.

Keywords: Effect; Parameters; Screening; Characteristics; Suspension; Sampling; Bioremediation

Introduction

The application of screening as an option for sampling is very necessary for effective results as well as the significance of sampling by subjecting the suspended particles into screening is of added advantage to the entire process. Bioremediation is a process that involved the application of microorganism to breakdown the heavier substance into environmental friendly substances that are not harmful to the environment. The application of these organisms to achieve our desired aim also influence the process that is either increase or decrease the concentration of other parameters while sampling [1-3].

Pollution of the environment by petroleum products is inevitable due to oil production, transportation and distribution activities [4-6]. The present study is aimed at application of screening effect when sampling a suspension in bioremediation process because of industrial activities pollution occurs in our environment, water, soil, are contaminated and some of this pollution are naturally initiated and some as result of man activities in so doing, for our environment to get rid of this, sampling and screening need to be carried out in this environment by initiated technology called bioremediation which is used in cleanup of our polluted environment [7-10]. Bioremediation can be briefly defined as the use of biological agents, such as bacteria, fungi, or green plants (phytoremediation), to remove or neutralize hazardous substances in polluted soil or water. Bacteria and fungi generally work by breaking down contaminants such as petroleum into less harmful substances [11,12]. Plants can be used to aerate polluted soil and stimulate microbial action. In the past few decades, the environmental pollution of toxic heavy metals is the major issue throughout the world since industrial evolution [13-17]. Chromium is one of the heavy metal whose concentration in the environment is increasing due to different industrial processes [18]. Bioremediation is the most promising and cost effective technology widely used now a days to clean up both soils and wastewaters containing organic or inorganic contaminants [9]. A variety of microorganisms have been known for their ability to degrade these heavy metals [5].

The aim of this research is to examine the effect of screening in sampling upon the influence of suspension as a time depended.

Materials and Methods

The research was considered to be an important factors that influence bioremediation sampling analysis. Although, several experimental or analytical procedures has been in practice as best method for sampling for the determination of the functional parameters or the physicochemical properties of contributing factors that influence the characteristics of elements and components that either increases or decreases concentration due to the screening process on bioremediation.

Computational procedures

In this research mathematical tool of matlab (Matrix Laboratory) computer programme language was employed to simulate experimental determined parameters as fitted in the matrix. The American Public Health Association Standard was employed during analysis of samples as well as the matrix illustrates experimental determined values from contaminated sample with focus on the total nitrogen, total phosphorus and pH for various period of sampling [19]. The sampled A, B and C was further examined in respect to time/day and the results obtained was formulated in matrix form and resolved as expressed in the model.

Parameters description

The parameters used in this investigation as shown below represents, A11, A21 and A31 for initial sampling or the first sampling, A12, A22 and A32 for intermediate sampling or second sampling and A13, A23 and A33 for final sampling or third sampling. The Y1, Y2, and Y3 represents the functional coefficient values and B1, B2 and B3 represents the average sampled parameter.

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Modelling and stimulation

Using the approach of matrix as described below, we have:

Results and Discussion

The formulated equation of matrix was simulated using the matlab computer programme language to examine the significance of screening characteristics of suspension during sampling processes and results obtained are presented in Figures for the parameters of total phosphorus, nitrogen and pH concentration.

The Figure 1 result illustrates the significant of screening of suspension characteristics in sampling bioremediation process as well as increase in the concentration of nitrogen was observed with increase in time. The increase in the nitrogen concentration can be attributed to the increase in rate of screening of the suspension of the undissolved particles, in which the characteristics may either increase or decrease the surface contact for effective remediation or sampling. It is also observed that the concentration of the nitrogen may inhibit the characteristics of other physicochemical parameters not been extracted from the process. The variation in the concentration of nitrogen can be attributed to the variation in time of sampling as well as the activity of the other functional parameters that control the system.

The Figure 2 result illustrates the significant of screening of suspension characteristics in sampling bioremediation process as well as increase in the concentration of total phosphorus was observed with increase in time. The increase in the total phosphorus concentration can be attributed to the increase in rate of screening of the suspension of the undissolved particles, in which the characteristics may either increase or decrease the surface contact for effective remediation or sampling. It is also observed that the concentration of the total phosphorus may inhibit the characteristics of other physicochemical parameters not been extracted from the process. The variation in the concentration of total phosphorus can be attributed to the variation in time of sampling as well as the activity of the other functional parameters that control the system.

The Figure 3 result illustrates the significant of screening of suspension characteristics in sampling bioremediation process as well as increase in the concentration of pH was observed with increase in time. The increase in the nitrogen concentration can be attributed to the increase in rate of screening of the suspension of the undissolved particles, in which the characteristics may either increase or decrease the surface contact for effective remediation or sampling. It is also observed that the concentration of the pH may inhibit the characteristics of other physicochemical parameters not been extracted from the process. The variation in the concentration of pH can be attributed to the variation in time of sampling as well as the activity of the other functional parameters that control the system.

The Figure 4 result illustrates the significant of screening of suspension characteristics in sampling bioremediation process as well as increase in the concentration of nitrogen, total phosphorus and pH was observed with increase in time. The increase in the nitrogen, total phosphorus and pH concentration can be attributed to the increase in rate of screening of the suspension of the undissolved particles, in which the characteristics may either increase or decrease the surface contact for effective remediation or sampling. It is also observed that the concentration of the nitrogen, total phosphorus and pH may inhibit the characteristics of other physicochemical parameters not been extracted from the process. The variation in the concentration of nitrogen, total phosphorus and pH can be attributed to the variation in time of
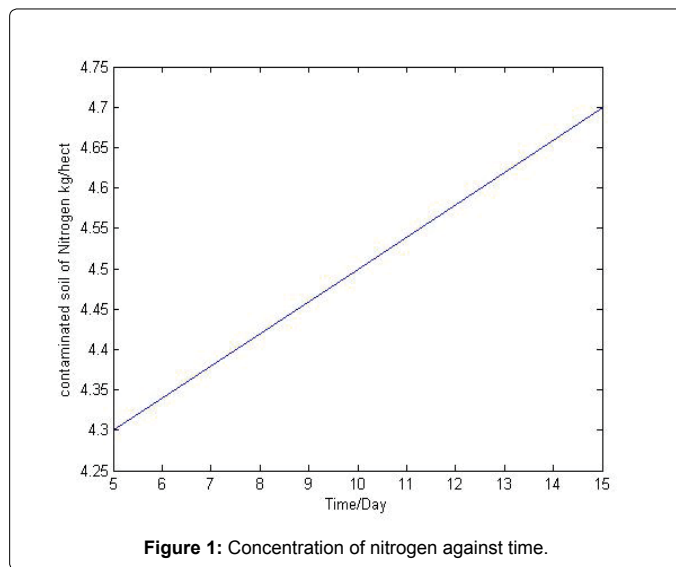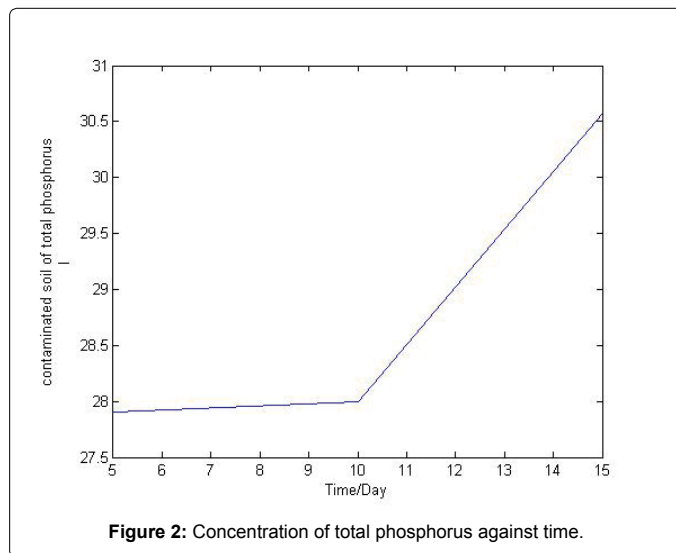

Figure 1: Concentration of nitrogen against time.

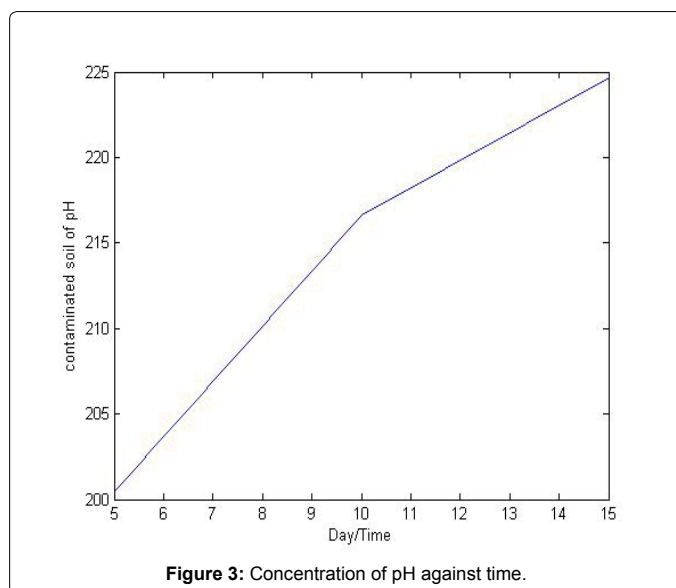**Figure 2:** Concentration of total phosphorus against time.

Figure 3: Concentration of pH against time.

Figure 4: Concentration of nitrogen, total phosphorus and pH against time.
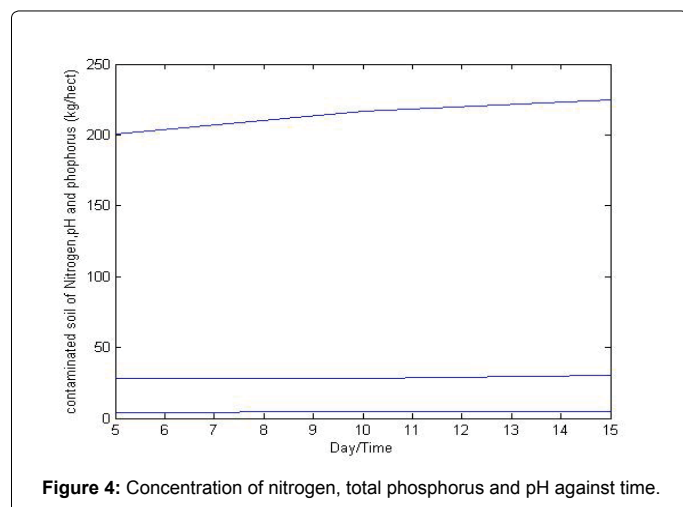
sampling as well as the activity of the other functional parameters that control the system. Figure 4 also illustrates the comparison of three of modeled samples and the trend in terms of characteristics is well explained, considering the fact that screening influence sampling of suspension.

Conclusion

The following conclusion was drawn from the research work:

1. The mathematical tools of matlab computer programme language is found useful in the monitoring, predicting and simulating the rate of screening of suspension impact during bioremediation process sampling.

2. Screening is found useful in terms reduction in the degree of toxicity.

3. Screening is also useful in increasing the sampling contact when the samples are subjected into analysis with the analytical equipment.

4. The screening induced the activity of microorganisms during sampling and other components associated the suspended substances.

5. Screening improves the concentration in terms of bioremediation.

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