Abstract

Environmental degradation has become a major societal issue. It is a result of uncontrolled anthropogenic activity, besides natural factors. There is a growing need for an in situ technology to remediate contaminated soils. Although, many remediation technologies for contaminated soils are available off the shelf but not too many are effective and economical for remediation of fine grained soils for the reasons of its low hydraulic conductivity, large specific surface area providing numerous active sites for dynamic, pH dependent, reversible, and very complex surface reactions. Electrokinetic remediation deserves to be considered for remediation of fine grained soils, however, the physical and chemical factors that may limit the application of electrokinetic remediation are yet to be adequately quantified. As a result, site screening using readily measurable soil characteristics cannot be performed.

Keeping this in mind, efforts were made to evaluate the impact of readily measurable common soil properties on the electrokinetic remediation process. Natural soil from the actually contaminated area of south Gujarat was taken for study. Removal efficiency was studied on two different soil types, spiked with the contaminants. Impact of each individual factor and collective impacts of different factors on the remediation were studied. The study was modeled using Artificial Neural Networks (ANNs) and Statistical Multivariate regression.

To date, many mathematical models are developed for studying electrokinetics. However, due to the fact that, most mathematical models attempting to solve complex problems are usually supplemented by simplifying the problem or incorporated with several assumptions. In contrast, Artificial Neural Networks (ANNs) are based on the data alone in which the model can be trained on input and output data pairs to determine the structure and parameters of model, needing no simplification or assumptions. Therefore ANN and Multivariate regression models were developed. These models were validated with the experimental data of remediation on actual contaminated soils.

The study also deals with the description of development of test setup and methodology to achieve the objectives.

Key words: Electrokinetic remediation, artificial neural network, multivariate regression, ANN, Electroosmosis, Electromigration