LOW COST METHODS FOR COLOUR AND METAL ION REMOVAL FROM INDUSTRIAL EFFLUENTS AND POLLUTED WATER

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Industrial development, urbanisation and uncontrolled agricultural practices have resulted in severe environmental problems in Sri Lanka. Many rivers, water streams and lakes in the country are already polluted with organic and inorganic pollutants. Thus, it is of great importance to monitor levels of pollution, and to introduce preventive measures by treating polluted waters using suitable methods. Investigation of the potential ability of economical and readily available naturally occurring substances such as Brick-clay, ball-clay, Kaolin, dolomite and saw-dust for treatment of polluted water is of great significance for a developing country.

Colour removal of industrial effluents by brick-clay, saw-dust, dolomite and ball-clay packed columns has been studied and in found to be efficient as well as economical. Cations of Ca, Mg, Cr, Mn, Fe, Co, Cu, Zn, Cd and Pb can also be effectively removed using brick-clay; kaolin, saw-dust and ball-clay packed columns. The efficiency of removal has been further enhanced by optimisation of experimental parameters such as particle size, length of packing and flow rate. Systematic investigation of standard solutions and mixtures

of these metals within the working concentration range shows that brick-clay is highly efficient in removing Co, Cd and Pb (>90%) indicating the preferential adsorption of these ions over the other cations. Although about 90% removal is achieved for Cr, Mn, Fe, Cu and Zn, main group cations (Ca and Mg) are removed with an efficiency of less than 50%.

The brick-clay packed column has a good potential as an adsorbent of lead from polluted water. It is a dangerous and hazardous chemical, which causes several abnormal diseases such as cancer, abortions, low birth etc. While the treatment method depends on physico-chemical forms of removal, effectiveness of the removal process depends on experimental parameters of the treatment procedure. Mechanistic studies of the process under optimised conditions are thus desirable for a better understanding.

The pH of lead ion solutions after treatment always lies in the vicinity of the neutral value regardless of the initial pH. The relationship between the amount of lead adsorbed on to brick particles and the bulk concentration of the lead ion solution between pH 4 and pH 6 shows the applicability of the Fruendlich isotherm for most cases, while the Langmuir model seems to fit in certain cases. A fraction of lead removed may be available as exchangeable ions, because concentrations of Ca^{2+}, Mg^{2+} and K^{+} in the eluent are very low. Such columns exhibit a reasonably high capacity toward the lead removal process.

This study shows that brick-clay is appropriate for the removal of colour and metal ions from polluted water. Further, the proposed method is economical and environment-friendly. Such methodology would offer unique advantages in the treatment of polluted water in developing countries.