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CONTAMINANTS REMOVAL BY BENTONITE AMENDED SLOW SAND FILTER

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Earlier studies have indicated that variability in size, surface texture and charge greatly influence the contaminant removal process in granular media. Based on surface characteristics of montmorillonite, it is anticipated that small addition of this clay would increase adhesion sites for bacterial growth and extracellular polymer production in slow sand filter and thereby enhance its contaminant removal ability. Experiments were performed by permeating groundwater conta-minated with pathogens (total coliform and E. Coli) and inorganic contaminants through bentonite amended slow sand filter (BASSF). Surprisingly, the BASSF retained inorganic contaminants besides pathogens. Water-leach tests (pH of water leachate ranged from 2 to 9) with spent BASSF specimen indicated that the inorganic contaminants are irreversibly adsorbed to a large extent. It is considered that the combined effects of enhanced - organic matter mediated adhesion sites and increased hydraulic retention time enables the BASSF specimen to retain inorganic contaminants. It is envisaged that BASSF filters could find use in treating contaminated groundwater for potable needs at household and community level.

Keywords: environment, granular materials, pollution.

Introduction

Slow sand filtration is one of the earliest forms of biological filtration process [1]. Slow sand filtration reduces bacteria, cloudiness, and organic level. The effective size of sand (D_{10}) used in slow sand filter lie in the range of 0.15 – 0.35 mm and flow rates range between 0.1 – 0.4 m/h [2]. The contaminant removal by slow sand filter (SSF) is attributed to straining through the filter skin (schmutzdecke) developed at the top few mm of sand, together with slow filtration rate promoted by the fine size of sand [2 – 3].

Stevik et al. [4] had reviewed factors affecting retention of bacteria in porous media. Besides biological and physical straining, adsorption is also considered to play an important role in immobilizing pathogens transported through the porous media. Further, variability in sizes, surface texture and charge of porous media are considered to greatly influence the contaminant adhesion process. Smaller particle sizes expose a larger surface area compared