DENITRIFICATION OF POTABLE WATER USING BIOLOGICAL AND ELECTROCHEMICAL METHODS

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ABSTRACT

Elevated concentrations of nitrate (as well as nitrite) in drinking water have always been accused of causing several serious diseases (e.g. various forms of cancer, blue-baby syndrome). In this work both electrochemical and biological processes were examined for nitrate removal from drinking water using various operating conditions. Concerning the biological process, a suspended-growth batch bioreactor was used to examine nitrate removal through hydrogenotrophic denitrification, providing carbon dioxide as carbon source for the microorganism's metabolic procedures. A mixed culture originating from a wastewater treatment plant was used to inoculate the bioreactor, while three different initial pollutant concentrations (40, 60 and 80 mg NO_3^--N L^{-1}) were tested. The performance of electrocoagulation using aluminum electrodes for the removal of nitrates from water was also studied. Although nitrogen gas was the desirable product of the procedure, significant concentrations of ammonium and nitrite were detected in the treated water. Therefore, electrochemical oxidation (using various anodes and cathodes) was also used as post treatment step to further remove such by-products generated from electrocoagulation. Various operating variables such as initial pollutant concentration, applied current density and time were tested for their effects on nitrate removal, in order to conclude whether such a treatment could be feasible and cost efficient.