Geophysical Research Abstracts
Vol. 21, EGU2019-16144, 2019
EGU General Assembly 2019

Treatment of mining impacted water using novel polyvinyl alcohol (PVA) gel beads bioreactor

Aparna Dutta and Sudipta Sarkar
Indian Institute of Technology Roorkee, Civil Engineering, India (aparnadutta9@gmail.com)

Treatment of high sulfate process stream is important to mining industries generating Acid Mine Drainage (AMD). AMD is formed when, pyrite and sulfides upon atmospheric exposure caused by mining and catalysed by microbial action release large amounts of sulfate into the mine water along with protons and dissolved metals. It can be treated through microbial dissimilatory sulfate reduction (DSR) in the presence of a suitable electron donor. The process supplies metabolic energy to the sulfate reducing microorganism (SRM) via adenosine triphosphate (ATP) production without incorporating the sulfate within biomass. An engineered biological sulfate reduction system is key to low cost treatment of such waters along with resource recovery in the form of elemental sulfur and metal sulfides. The SRM are slow growers due to their anaerobic metabolism that generates lower energy than the aerobic pathway. In continuous flow through reactors, prolonging the mean cell retention time over the hydraulic retention time is challenging in absence of appropriate surface for attached cell growth. Thus, application of a suitable immobilization medium is essential for sulfate reducing bioreactor operating in a continuous mode. Thus, the objective of this work is to investigate the performance of a novel upflow anaerobic sulfate reducing bioreactor packed with highly porous PVA gel beads for treatment of sulfate bearing mining impacted water. Experiments are conducted under different conditions of pH and hydraulic retention time (HRT) in a cylindrical continuous flow lab scale bioreactor. Anaerobic sludge from the bottom of a distillery wastewater treatment pond is used as inoculum. Enrichment of SRM within the bioreactor is carried out in fed-batch mode with periodic recirculation for one month using Modified Postgate's medium B. Oxidation Reduction Potential (ORP), pH, sulfate removal, total inorganic carbon (TIC) and alkalinity produced are measured at the bioreactor outlet to monitor the process. The use of highly porous beads imparts the system resilience to variation in operational flow and pH under mesophilic conditions. The process successfully enhances the pH along with reduction in sulfate concentration. Thus, the PVA gel beads, present themselves as a promising bio-carrier for application in sulfate reducing bioreactors. The study provides an insight into the application of the same to biological treatment methods relevant for different mining impacted water.