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Topic: Removal of Arsenic from Water by Polymeric Materials

Abstract

The stipulation of clean, wholesome water is a fundamental requirement for a healthy life. Sadly, many pollutants in water streams have been identified as toxic and harmful to the environment and human health. It is wearing almost a decade since arsenic poisoning known in worldwide problem and considered as a high priority one. Scientist estimated that billion of peoples have been reported to be at risk due to the consumption of arsenic from ground water for drinking purpose. Consuming drinking water that contains arsenic at high levels has been found to increase the risk of skin cancer and tumours of the bladder, kidneys, liver and lungs. Arsenic cannot be destroyed, but it can be changed into different forms or it can form insoluble compounds with other elements. As a consequence, arsenic is considered highly toxic contaminant and it makes sense to develop tremendous environment friendly and enduring technology for arsenic removal which is tailored for small and under developing communities. From the above statement regarding the arsenic problem in water, we are trying to distinguished polymer based material with active functional group for chelating this toxic material by chelating process under different conditions. In this manner the basic polymer is being functionalized by different process and their application part has been discussed in below.

Chapter II deals with the simple esterification reaction of polyvinyl alcohol (PVA) with thioglycolic acid (TGA) in presence of (H_2SO_4) as catalyst which offers an attractive route to develop thiol content in base material. It was observed that the esterification is significantly influenced by the reaction conditions, such as reaction time, temperature, alcohol, acid and catalyst concentration. However, as all parameters increases a sharp acceleration was observed in thiol content due to the proper interaction between the presenting groups of acid

and alcohol. The calculated thiol content is directly proportional to the acid and catalyst concentration, reaction time and temperature.

Chapter III deals with the crosslinking of derived thiolated PVA with different nature of crosslinker at various influenced parameters. Previously derived TPVA have been post cross-linked by using different crosslinking reagents i.e. sodium trimetaphosphate (STMP), boric acid (BA), glyoxal (GLY), under alkaline conditions. The effects of the different crosslinking reagents on the physicochemical and structural characteristics of crosslinked thiolated PVA were evaluated. The crosslinking reaction was carried out at different conditions i.e. TGA concentration, crosslinker nature, crosslinker content and crosslinking time, resulting sample was showing inverse relation with thiol content and swelling studies.

Chapter IV deals with the characterization of virgin and modified PVA. The crosslinked TPVA films have been characterized by TGA, DSC, XRD, FTIR and coupled TG-FTIR techniques. The influence of the esterification and crosslinking on the physical structure of the material was studied through different techniques.

Chatpter V deals with the application of novel PVA based chelating material bearing thiol groups for arsenite removal from water. Batch experiments were applied to evaluate the As(III) removal performance of the chelating material. The effects of several parameters pH, compositions of components and contact time for As(III) removal were examined. Atomic absorption spectroscopy (AAS) was used to calculate removal efficiency. Results obtained revealed that the crosslinked TPVA behave as a good chelating material for As(III). A removal efficiency of approximately 94.5% was obtained. In order to determine the reusability of the crosslinked TPVA the removal and regeneration process was repeated several times. The arsenite riched crosslinked TPVA membrane has been used for the regeneration process at different conditions. The resulting material has shown good regeneration ability with antifungal property.