Manish Ranjan[1], Prabhat Kumar Singh[1], Arun Lal Srivastav[2], Vikram Kumar[3]*

[1]Department of Civil Engineering, IIT (BHU), Varanasi, India;

[2]Chitkara University School of Engineering and Technology, Chitkara University, Himachal Pradesh, India;

[3]Department of Hydrology, IIT Roorkee, Uttarakhand, India

ADSORPTIVE PROPERTIES OF CATION ADDED HYDROUS BISMUTH OXIDE ON NITRATE SORPTION

Groundwater contamination by non-metallic inorganic contaminants has become a severe problem to the human kind and its healthy survival. Nitrate contamination of drinking water has become a major health threat in many countries of the world including India and this issue needs to be resolved through developing advance technology to scale down the nitrate concentration and to make the water fit for drinking. With the ultimate objective of developing an inorganic and sustainable sorptive media for nitrate abatement from drinking water, hydrous bismuth oxide (HBO) has been synthesized and studied as an adsorbent for aqueous medium in the present work. Hydrous bismuth oxides based adsorbents are found to have nitrate sorptive properties along with their possible application in drinking water treatment. In an attempt of improving the potentials of HBO, incorporation of cations such as copper, iron and two transition metals each of which has vividly been used in the preparation of bi-metallic adsorbents as well as polymeric ligand exchangers. Calcium and Magnesium were included for their wide availability and possible value addition towards the purpose. HBO adsorbent mixed with cations, which has shown highest nitrate sorptive potential was characterized using X-Ray diffraction pattern, Scanning electron microscopy and Fourier Transform Infrared spectroscopy analyses. It was observed that incorporation of these individual cations, the Mg and Ca did not show any improvement whereas the presence of Fe and Cu within the matrix of HBO has shown significant improvement in nitrate sorption potential of HBO and it was inferred that presence of Ca, Mg and Fe appear to be helpful in the formation of polymeric structures. Scherrer crystallite size slightly improved in presence of Mg and Fe.

Keywords: hydrous bismuth oxides, nitrate removal, cationic ligands, characterization, Scherrer crystallite size.

INTRODUCTION

Ground water serves as source of drinking water for a large population in India. Most of the rural and urban population in India largely depends on ground water for their domestic requirement. Contamination of groundwater intended to be used for drinking is a worldwide problem that has economic and human health impacts [1]. However, contamination of ground water is due to various reasons including inorganic or organic chemicals making it unfit for drinking. The fast deg-

* Для листування: manish040533@gmail.com

рокой доступности и возможного влияния на улучшение сорбционных свойств ВОВ. Последний с добавкой катионов, показавший наибольший потенциал в отношении сорбции нитратов, был охарактеризован с помощью рентгеновской дифракции, сканирующей электронной микроскопии и инфракрасной спектроскопии с Фурье-преобразованием. Отмечено, что включение катионов Mg и Ca по отдельности не способствовало какому-либо улучшению сорбционных свойств, тогда как присутствие Fe и Cu в матрице ВОВ показало заметное повышение сорбции нитратов ВОВ, и было выдвинуто предположение, что присутствие Ca, Mg и Fe, по-видимому, способствует формированию полимерных структур.

Ключевые слова: водные оксиды висмута, удаление нитратов, катионные лиганды, характеристика, размер кристаллитов Шеррера.