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Arsenic Problems in Myanmar

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Abstract

Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. Water sources can be contaminated with natural arsenic deposit.

In Ayeyarwady Region, Myanmar, although main source of drinking water for local people is rain water, it is shifted to underground tube well water due to the recession of rain, easy access and technological achievement. Since 1999, Arsenic was firstly identified by Water Resources Utilization Department (WRUD) in Bago Region. Then, arsenic mitigation project was done in 16 Townships and Regions, around Myanmar by WRUD and Department of Development Affairs (DDA) in 2001. An analysis of Arsenic Content in Drinking Water Sources of Ayeyarwady Region was started by UNICEF in 2004. According to this study, (379) water sources of 14 villages contained arsenic concentration higher than 200 µg/L.

In 2016, arsenic mitigation project was done in 7 villages of Thabaung Township, Ayeyarwady Delta region by collaboration between Department of Medical Research and University of Miyazaki. The project title is "The Project for Promoting Environmental Health in Arsenic Contaminated area in Myanmar". The project purpose is to develop the implementation system of the environmental health by collecting and analyzing the basic health data, and taking counter measures against unsanitary drinking water in the arsenic contaminated area. This was a three years project comprising of medical part, water supply part and resident's awareness part. In this study, 904 households (3846 population) were using (181) tube wells in which 68 % (123/181) of these tube wells contained arsenic concentration higher than 50µg/L. In the medical part, it was found that 20.9% (43/205) and 22.3% (25/112) of hair samples had arsenic concentration higher than 1000 µg/L in 2016 and 2017 respectively. Two units of safe water supply system (Gravel Sand Filter) had been established at Konetangyi village and Latechaung village in Thabaung Township. Awareness program was carried out at schools and 96% (1227/1270) of total students attended. Whereas small group awareness program was done in their houses and 83 % (3711/4452) of villagers participated. In evaluation survey 2018, it was found that 78 % (573/735) had knowledge about arsenic. The implementation of arsenic mitigation system based on the findings of this project which will be completed in August 2018, is expected to benefit the community living in arsenic contaminated areas by reducing the risk of arsenicosis through provision of arsenic-safe water.

Keywords: Arsenic, Groundwater, Arsenic removal, Myanmar

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Extraction of Cu(II) with microcapsules of cross-linked gel of poly(vinyl alcohol)/alginic acid encapsulating dispersed droplets of phenolic oxime extractant

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Abstract

PVA/Alg-GA crosslinked-gel microcapsules containing phenolic oxime extractant, LIX84-I, were prepared by falling-drop method of O/W emulsion followed by crosslinking of Na-Alg by Ca^{2+} ion and crosslinking of PVA by glutaraldehyde. The small droplets of LIX84-I were observed in the microcapsules. The contents of LIX84-I in the microcapsules increased with the added amounts of LIX84-I to the aqueous polymer solution. The maximum amounts of Cu(II) extracted in the microcapsules increased linearly with the LIX84-I contents with the slope of 1/2 which means two molecules of LIX84-I react with one Cu(II) ion. The high durability of the microcapsules was confirmed by the repeated use for extraction and back-extraction of Cu(II).
Keywords: Gel microcapsules, Cu(II) extraction, Phenolic oxime extractant, Alginic acid, PVA

1. INTRODUCTION

Microencapsulation of extractants for metal ions, organic acids, amino acids and various compounds is one of the effective methods to overcome some disadvantages on the liquid-liquid extraction process, such as the difficulty in phase separation by the formation of stable emulsion or third phase between aqueous and organic phases, and use of a large amount of organic solvent.

In this study, PVA/Alg-GA crosslinked gel microcapsules containing phenolic oxime extractant, 1-(2-hydroxy-5-nonylphenyl) ethanone oxime (LIX84-I) were prepared by crosslinking of Na-Alg by Ca^{2+} ion and crosslinking of PVA by glutaraldehyde. The microcapsules containing LIX84-I have an ability to extract Cu(II) in the aqueous ammonium sulfate solution. The extraction properties of Cu(II) in the solution using the microcapsules were investigated under various conditions, such as effects of LIX84-I contents, Cu(II) concentration and repeated use of the microcapsules.

2. EXPERIMENTAL

2.1 Preparation of microcapsules

The microcapsules containing LIX84-I were prepared by the same procedure as shown in the previous paper (Komatsu *et al.* 2016). An aqueous solution containing poly(vinyl alcohol) and sodium alginate (Na-Alg) and LIX84-I as an organic phase were mixed to form O/W emulsion at room temperature. The O/W emulsion was extruded from a needle to an aqueous calcium chloride solution to form droplets and immersed for 30 min with gentle stirring for crosslinking of Na-Alg by Ca^{2+} ion. The capsules were then transferred to hydrochloric acid aqueous solution dissolving glutaraldehyde and immersed for 2h with gentle stirring for crosslinking of PVA by glutaraldehyde.

2.2 Extraction of Cu (II) from aqueous solutions

The experiments were carried out in a batch-wise by contacting the microcapsules and the aqueous solution containing Cu(II) at given time. After extraction, the

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