Improvement of raw groundwater quality from arsenic contamination via oxidation and ion-exchange water filters: A case study of Ban Wang Hin, Suphan Buri Province

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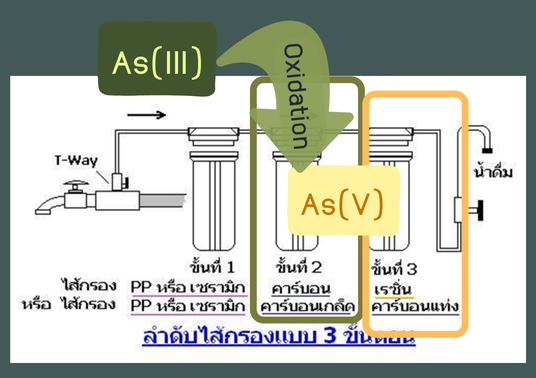
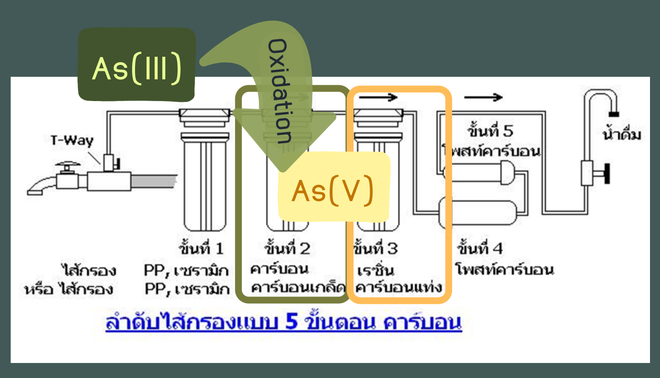
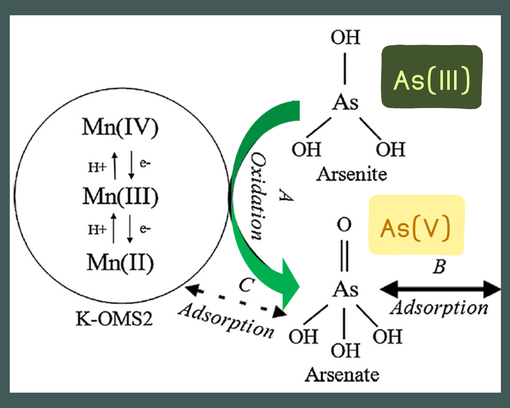
Introduction

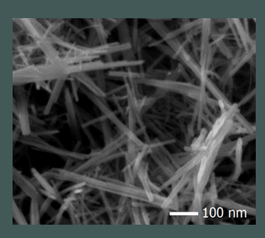
Arsenic contamination in groundwater in Thailand is caused by many factors. Finding a way to remove arsenic contaminating groundwater supplies is vital and necessary, particularly, the removal of arsenite (As(III)) which is more toxic than arsenate (As(V)).

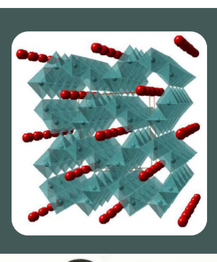
This research aimed to develop a method to improve the quality of As(III)-contaminated raw groundwater at Ban Wang Hin, Yan Yao Subdistrict, Sam Chuk District, Suphan Buri Province using oxidation and ion-exchange water filters.





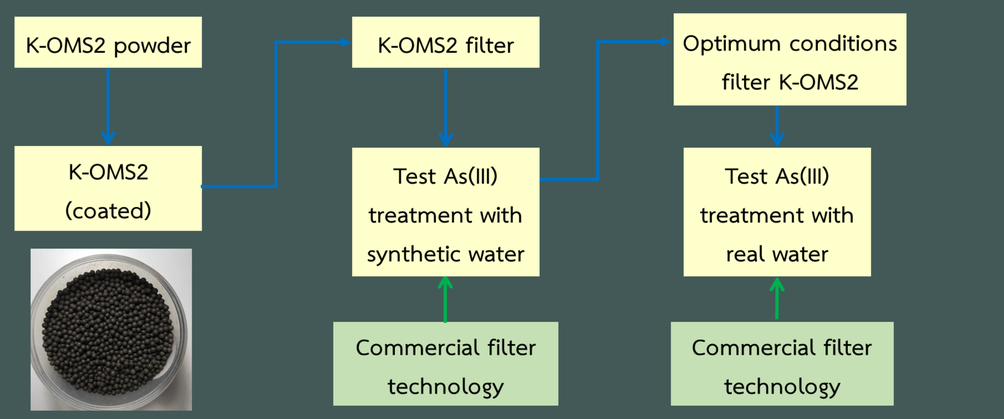




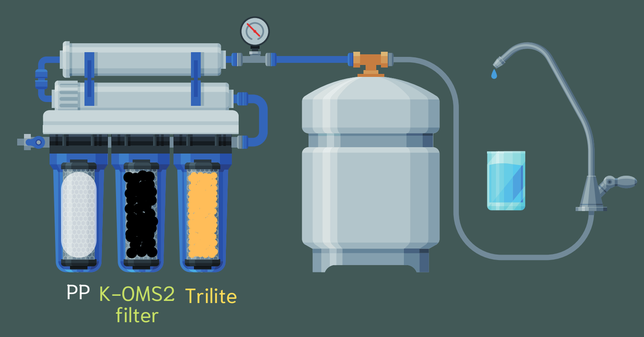


Methodology

The methodology included a survey of the arsenic-contaminated raw groundwater in Suphan Buri Province area, the preparation and characterization of K-OMS2, the As(III) to As(V) oxidizing efficiency test of the K-OMS2 water filter, the total arsenic (total As) removal capacity test when the K-OMS2 water filter equipped with the Trilite water filter, and safety study of the K-OMS2 water filter via a leaching test

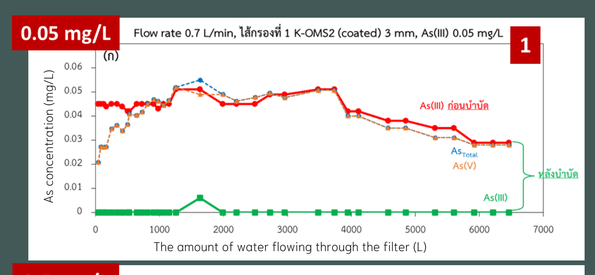


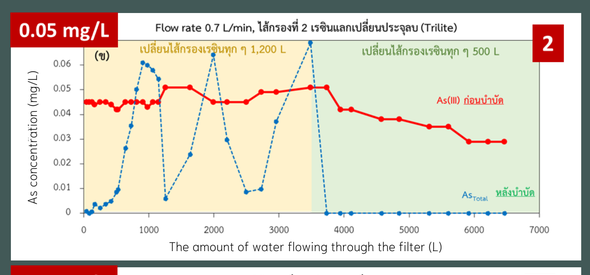
The oxidation water filter consisted of K-OMS2, a type of manganese oxide, as an active material to oxidize As(III) to As(V) while the ion-exchange water filters consisted of Trilite, commercially anionic exchange resin, playing a role as an As(V) capture.

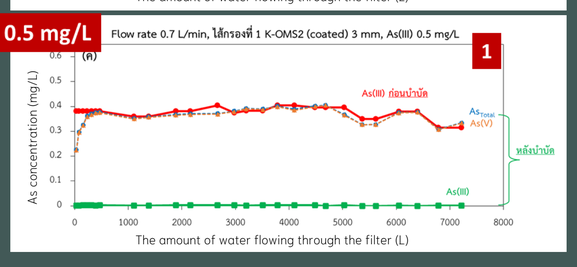


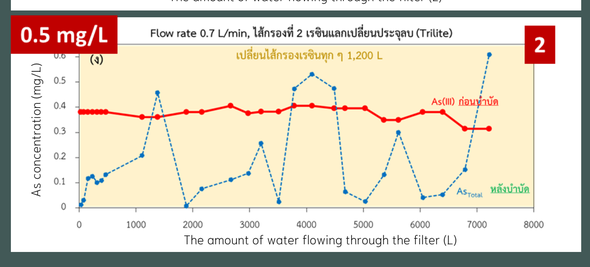
Results and Discussion

Laboratory analysis

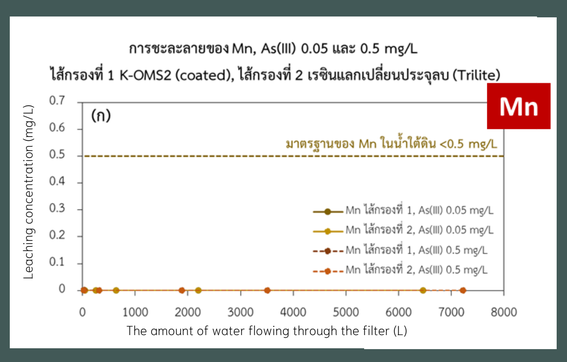


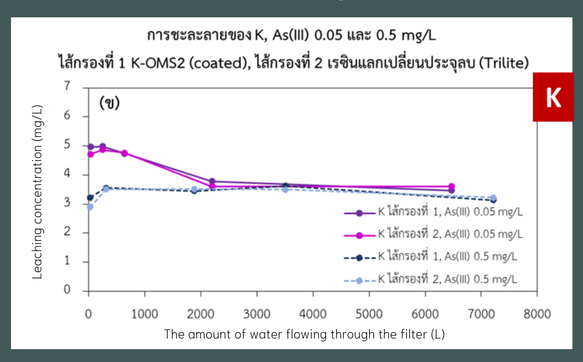






Total As treatment takes place intermittently in anion exchange resin filters



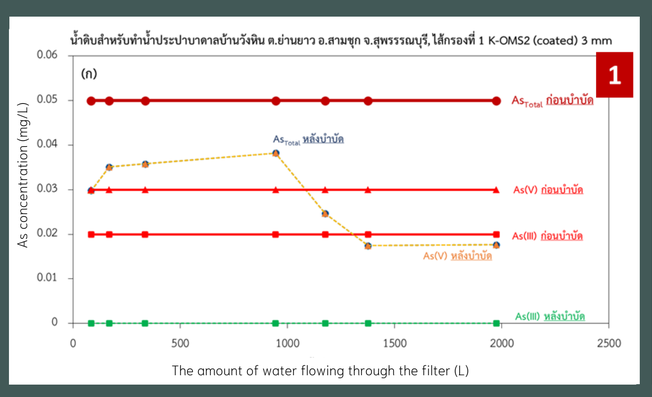


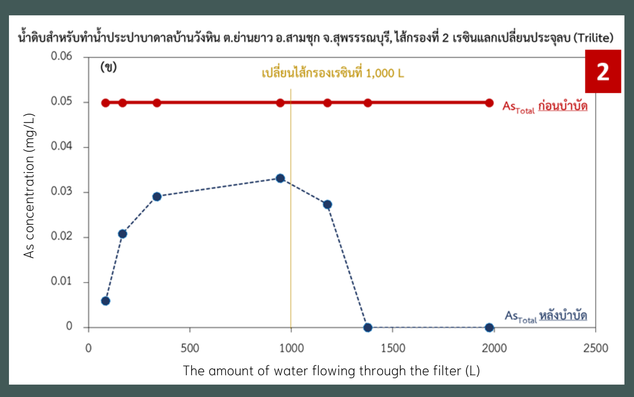
For the leaching safety study of Mn and K, the main component elements of the K-OMS2 water filter, the leaching values of the filters were low and relatively stable.

Field Analysis

From the survey, among other groundwater samples in Suphan Buri Province area, the raw groundwater samples used for the production of tap water supply in Ban Wang Hin area, Yan Yao Subdistrict, Sam Chuk District, Suphan Buri Province contained the concentration of total As in the range of 0.035-0.057 mg/L, and As(III) was found in the raw groundwater with a maximum of approximately 40% As(III) in the total As measured.

As(III) could be completely oxidized by the K-OMS2 water filter for the raw groundwater samples of Ban Wang Hin throughout the 2,000 L-treatment at a flow rate of 0.7 L/min. However, the total As was captured to a certain extent over the Trilite water filter, and the total As concentration gradually increased until a new cartridge was replaced at water running of every 1,000 L.

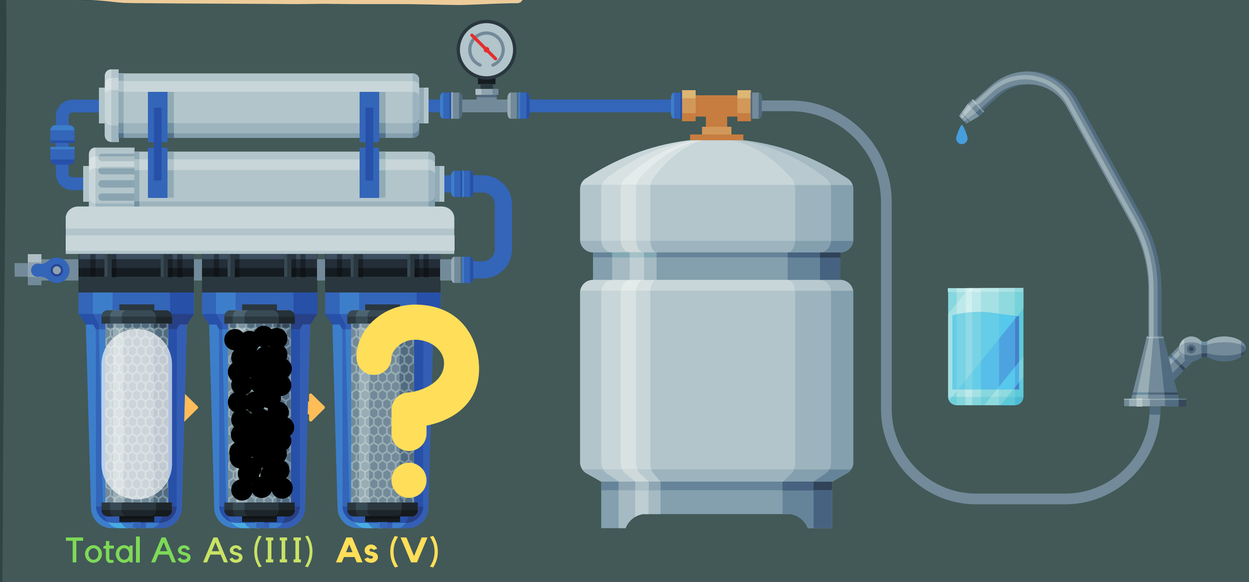




Conclusions

Therefore, the **K-OMS2** water **filter** is **applicable** for oxidizing **As(III)** in **groundwater** whereas the Trilite water filter is not yet appropriate to use for the treatment of As(V), which needs further study.

Future Research



Acknowledgements

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