The Development of 3R Water Filter to Solve the Problem of Arsenic Poisoning in Vietnam

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Arsenic contamination of drinking water has been spotlighted on global health, especially in a field of WASH. This is the current situation in Vietnam, whose legal arsenic concentration limit is 50 μg/L, five times higher than the WHO guidelines. In South-East Asia affected areas, substitution of drinking water source by a safe and easily available one may be very expensive. This paper introduces a new type of water purifier in achieving affordable, safe drinking water for the marginalized population in a rural area.

The goal of this project is to design an affordable and easily manufactured water filtration system for use in a rural area. At this point, the author focused on the basic principal of ceramic water filter which is produced by combining only rice bran and soil because of cultural characteristic that East Asia have in common. However, ceramic water filter shows several weak points like low durability (in a month), low flux(1~2L/h) and not being able to remove arsenic.

Villus shape to improve membrane flux during metabolism has been well known as expanding surface area. Round wave shape based on the principal of villus shape was applied to the design of the bottom of the ceramic water filter. As a result, a flux on the filter with round wave shape increase up to 280%(6.48L).

Iron oxide is the most useful arsenic removal technology and is more appropriate where very high arsenic levels are required. However, Iron oxide is more expensive than other arsenic removal options. In order to substitute rusty iron by-product for iron oxide which is used in industry, the rusty iron wire was combined with the bottom of the ceramic water filter. The experiment shows that the filters with rusty iron wire removed the arsenic up to 95.6% (1000ppb -> 46ppb).

This purpose of this study was to investigate the effectiveness and the performance of the 3R Water Filter, which is a ceramic filter with rusty iron wire and round wave shape. To achieve this, the author undertook a field trip to Hanoi in August 2016. The trip was made possible with support provided by theæNational Institute of Occupational and Environmental Health (NIOEH) and UN WHO Technical Officer in Environmental Health, the author spent 3 weeks in Hanoi - 7days in the Bat Trang called pottery village that can manufacture our product, and 15 days in the Tam Xa district collecting water samples.