PAPER-BASED MICROFLUIDIC DEVICE TO DETECT ARSENIC IN DRINKING WATER

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Arsenic in natural water sources is a major environmental concern in modern world. It has been found that consuming water contaminated with arsenic may lead to many health problems in humans. The current analytical methods for the determination of arsenic in natural water sources require sophisticated and expensive instrumentation and skilled personnel. Therefore developing countries such as Sri Lanka with limited resources should pay more attention in search of new methods that avoid the use of expensive instrumentation. A paper-based analytical device for the detection of arsenic level in natural water sources is proposed as a better solution for the detection of arsenic in water samples. This proposed method is a quick, portable, and on-site qualitative method for the detection of arsenic. The microfluidic devise was developed with chromatographic paper by creating channels with wax. One-end of these channels were treated with a colour reagent that changes its colour rapidly upon the addition of a microliter volume of water contaminated with arsenic. After the colour is developed, the test zone was scanned to obtain an image which was then imported to a computer. Mean colour intensity of the test zone was obtained using an image editing software where the pixel value is related to arsenic concentration. Resultant colour intensity was compared with a calibration plot produced with standard arsenic solutions using the same method. This method has a minimum detection limit of 1 ppm arsenic in water. These results were validated using atomic adsorption spectrophotometric method. Therefore the technique developed in this research project provides a rapid, easy and economical method with a considerable detection limit for arsenic.

Keywords: Microfluidic devices, On-site detection of arsenic, Paper-based devices