

**FABRICATION AND DEVELOPMENT OF A PAPER-BASED MICROFLUIDIC
DEVICE FOR ELECTROCHEMICAL ANALYSIS OF
COUNTERFEIT DRUGS**

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Drugs of poor quality or lacking active ingredients are considered counterfeit and are a serious global health threat. This issue can be substantially minimized by frequent testing in the field of concern using an analytical device that is readily available, inexpensive, and portable. Low-cost microfluidic devices based on filter papers, where capillary action drives fluid flow, have been reported as a promising analytical tool to separate small molecules within minutes. Additionally, graphite pencils have been successfully used to fabricate low-cost electrodes to obtain electrochemical measurements. In this study, microfluidic device based on filter paper coupled with paper-based electrodes was explored for the detection of pharmaceuticals. The channel pattern on filter paper was constructed by masking it with a 1 mm wide adhesive tape and immersing it in recycled polystyrene in chloroform. The amount of hydrophobic reagent was optimized as 0.060 g/mL by measuring the contact angle. The working electrode and pseudo reference electrode were fabricated using graphite pencil lines and silver paste, respectively, using a simple plotting method. Acetaminophen and ascorbic acid were separated and detected using the developed paper-based microfluidic device with distinct amperometric peaks, showing high sensitivity. Migration times of 600 s and 350 s and peak currents of 0.35 μ A and 0.56 μ A for acetaminophen and ascorbic acid, respectively, were obtained for a channel distance of 1 cm. This technology enabled precise and simple control over channel formation and electrode fabrication, ensuring reliable fluid flow and sensitive electrochemical detection. Future studies will focus on constructing calibration curves for acetaminophen and ascorbic acid based on the peak areas of the amperograms.

Keywords: Acetaminophen, Ascorbic acid, Counterfeit drugs, Electrochemical, Paper-based microfluidic device