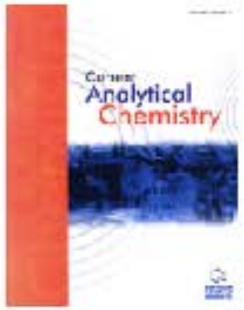

Investigating the Enhancement of Microfluidics-Based Electrochemical Biosensor Response with Different Microchannel Dimensions

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The microfluidics-based electrochemical biosensor (MBEB) is a new approach to laboratory diagnostics that offers many advantages over the conventional bulky and expensive laboratory instruments. Despite its small size and portability, the biosensor requires a specific sample volume to completely cover the detection zone and be analyzed. However, the sample volume for a particular microchannel size is of crucial importance, and the use of an inadequate sample volume results in less accurate measurements, lower sensitivity and increased detection limits. Therefore, this paper investigated the effects of microchannel size on sensor performance. First, microchannels ranging in size from 100- 1000 μm were fabricated, integrated and bonded to an electrode chip. Cyclic voltammetry scans for four different microchannel sizes fabricated for an electrode size of 100 μm were then conducted. The response and sensitivity of the fabricated biosensor increased with increasing microchannel size. The highest sensor sensitivity was observed using a microchannel size of 400 μm, and the response was maximized when a sufficient amount of the target was loaded in the microchannel. However, further increasing the microchannel size decreased the response current of the sensor due to the uncompensated solution resistance, which was considered a minor factor affecting the sensitivity of the sensor. Thus, optimizing the size of the channel is critical for maximizing the sensor performance.