

Electrochemical Signal Amplification by Redox Cycling in Distance-Controlled Nanogap Devices

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Redox cycling in between the two working electrodes in an electrochemical cell can lead a great signal enhancement. In this work, we report on a systematic examination of current amplification along with the decrease in the gap distance of a nanogap device which was fabricated by the combination of photo and chemical lithography [1]. The gap distance was controlled by the chemical lithographic process of surface-catalyzed growth of metallic layer on pre-defined electrodes with wider initial gap. Enhancement of the redox current of ferri/ferrocyanide was observed upon gap distance reduction and the current is amplified about a thousand times in this redox system when the gap distance was decreased from 200 nm to 30 nm. The experimental results were discussed on the basis of the cyclic voltammetry (CV), atomic force microscopy (AFM) and scanning electron microscopy (SEM).

Keywords: Nanogap device, Cyclic voltammetry, Signal amplification