

Electronic Supplementary Material (ESI) for RSC Advances

Electronic Supplementary Information

In Situ Controllable Synthesis of Cotton-Like Polyaniline Nanostructures for H_2O_2

Sensor by Using Embedded Three-Electrode Microfluidic Chip

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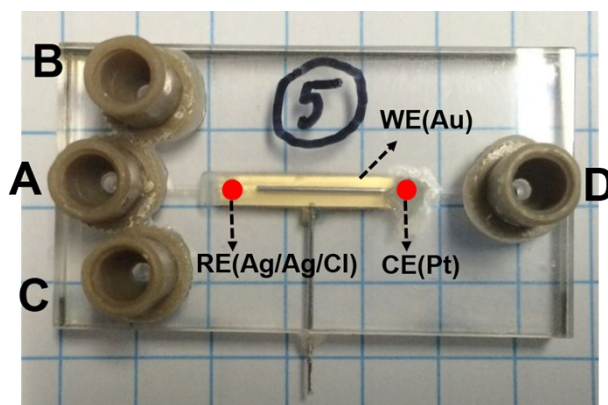


Fig.S1 Top view of mockup and setup of TEMC

The feature sizes of TEMC are 45 mm, 25 mm, 3 mm in length, width and thickness, respectively, designed by using CAD 3D Excalibur software (Progressive software corporation, USA) as shown in **Fig. S1**. The configuration of microfluidic chip is a sandwich structure consisted of top PMMA sheet, PVDF membrane, adhesive film, bottom PMMA sheet, and two main channels for electropolymerization. The electrodes of TEMC were connected to outer electrochemical workstation. The bottom PMMA sheet was tailored by a T-shape channel, whose feature sizes are indicated in Fig. S1. We deposited 200nm of Au on the T-shape channel as the working electrode (WE) for the PANI growth.

On the other hand, the top PMMA sheet was tailored to have two parallel channels (19-mm-length, 0.5-mm-width, and 0.5-mm-depth) to attach the Pt wire and Ag/AgCl wire, which are counter electrode (CE) and reference electrode (RE) of electrochemical system, respectively. Two holes at the

end of each channel were drilled through top sheet for electrode access. Other channels (10-mm-length, 0.5-mm-width, and 0.2-mm-depth) were used as liquid bypass and four access holes (1.5mm in diameter) drilled at both ends of the channels for the reservoir and outlet.

A is the inlet for precursor solution and H_2O_2 solution, B and C are the inlet of H_2O and air for cleaning procedure (Fig. S1). According to the CAD design of TEMC, the all patterns were fabricated through micro-milling on the PMMA sheets.

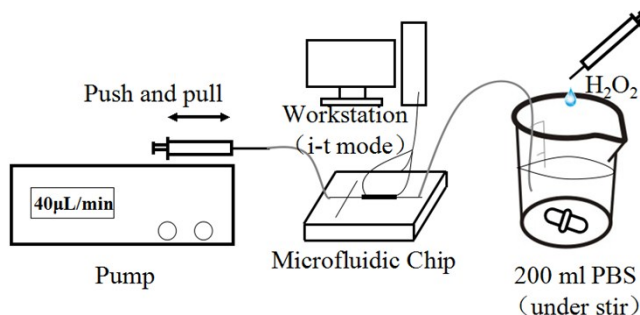


Fig. S2. The process flow for on-line H_2O_2 detection system.

Different from the common electrochemical cell, solution in the TEMC flows is continuous process which could support on-line monitoring. Based on this characteristic, we designed a system as shown in **Fig. S2**, which has a trace pump that can push and pull for cycles to control the liquid flowing, the flow velocity was set as $40\ \mu\text{L}/\text{min}$ and the volume set as $500\ \mu\text{L}$. The syringe on the pump connected with TEMC inlet A (B and C are stuffed), outlet D is connected with a beaker filled with PBS buffer, H_2O_2 were added into beaker with PBS buffer under stirring to get corresponding concentration, since the channels in TEMC are micro-size, the volume influence could be ignored. TEMC was connected with electro-chemical workstation, and the measurement was taken under i-t mode.