Microfluidic artificial photosynthetic system for continuous NADH regeneration and L-glutamate synthesis

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Supplementary Information

1. Calibration of protein amount

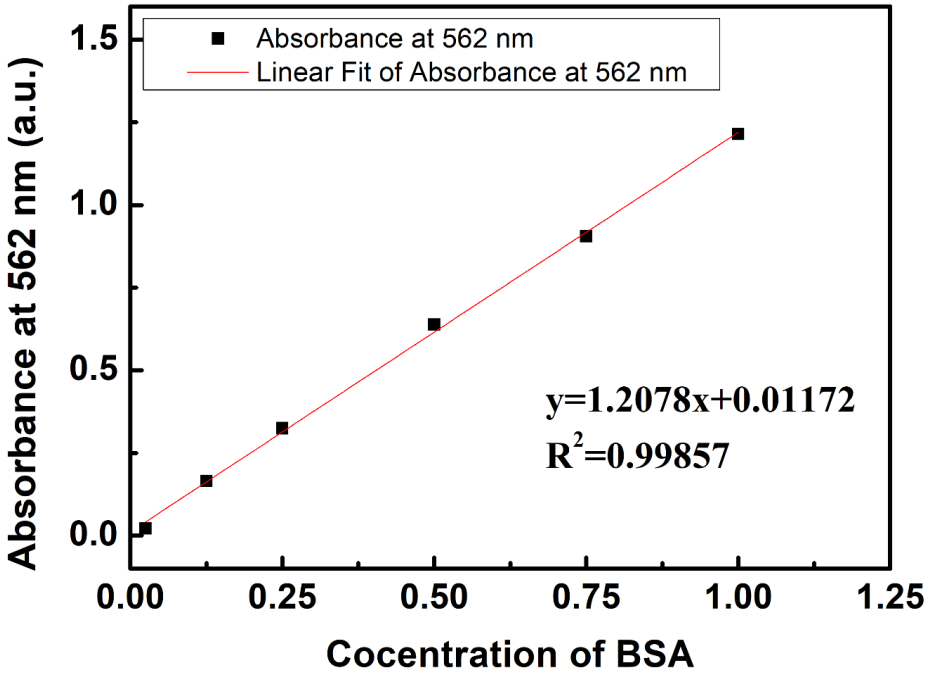

Figure S1. Calibration of protein amount determined from BSA solution. Protein amount was qualified using the BCA Protein Assay Kit (Meilune Biotech, China), which were determined by measuring the absorbance at the wavelength of 562 nm using a Ultramicro ultraviolet spectrophotometer (NanoDrop 2000, Thermo Fisher Scientific, USA). BSA solution (0.025-1 mg·mL^{-1}) were selected as standards to plot the calibration curve.

2. HPLC analysis

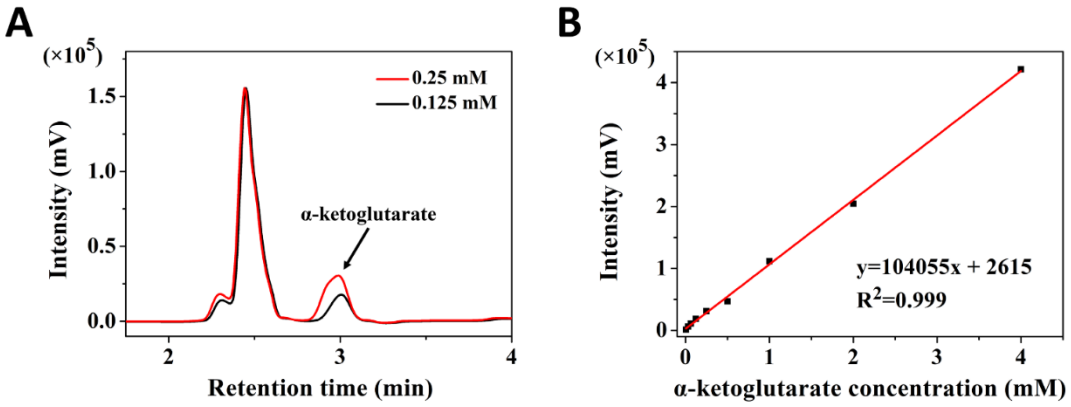

Figure S2. HPLC chromatogram and standard curve of α-ketoglutarate. (A) HPLC chromatography of the α-ketoglutarate with the concentration of 0.25 mM and 0.125 mM. (B) Calibration of the height of the α-ketoglutarate as a function of its concentration. The monitoring of the reaction was performed using a high-performance Liquid Chromatography (HPLC, LC-20AB, Shimadzu Corporation). A C18 column (Acchrom Tech, 4.6 mm×250 mm, 5 μm) was used for the chromatography separation. The samples were eluted with phosphoric acid (0.01%) at the flow rate of 1.0 mL min^{-1} and detected at 203 nm.

3. Characterization of the few-layer g-C_3N_4

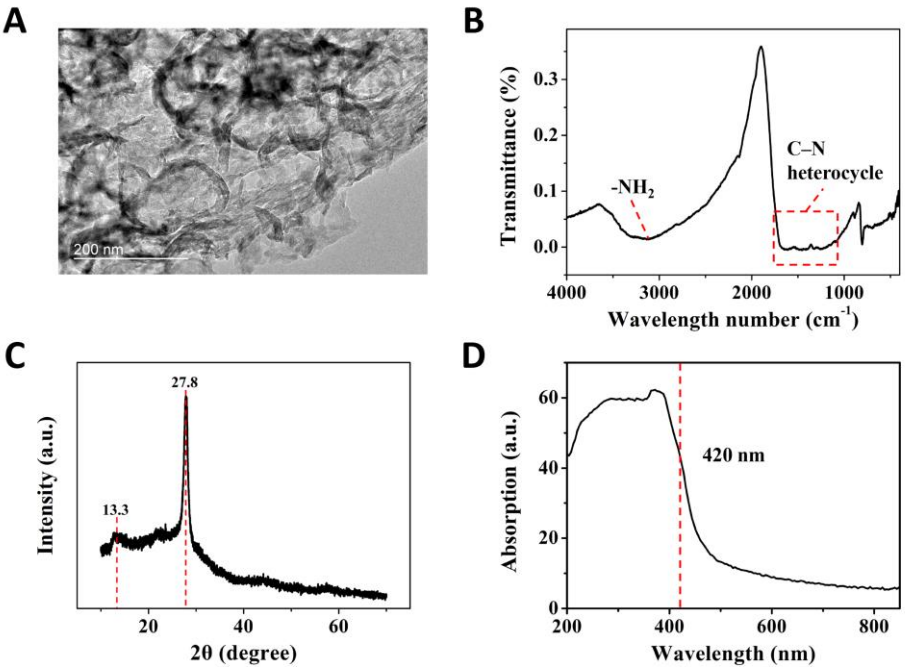

Figure S3. Characterization of the few-layer g-C_3N_4. (A) The TEM image of the few-layer g-C_3N_4 material, shows the graphene-like appearance. (B) FTIR spectrum of the few-layer g-C_3N_4, showing typical C–N heterocycle stretches at 1600-1200 cm^{-1}, as well as the characteristic breathing mode of triazine units at 806 cm^{-1}. The broad peaks between 3000 and 3500 cm^{-1} are attributed to the N–H band. (C) XRD spectrum of the few-layer g-C_3N_4 with two peaks at 13.3° and 27.8°, ascribed to the lattice planes parallel to the c-axis and the stacking of the conjugated aromatic system, respectively. (D) UV-vis absorption spectrum of the few-layer g-C_3N_4, which is broad, ranging from UV light to visible light.

4. Optical microscope analysis

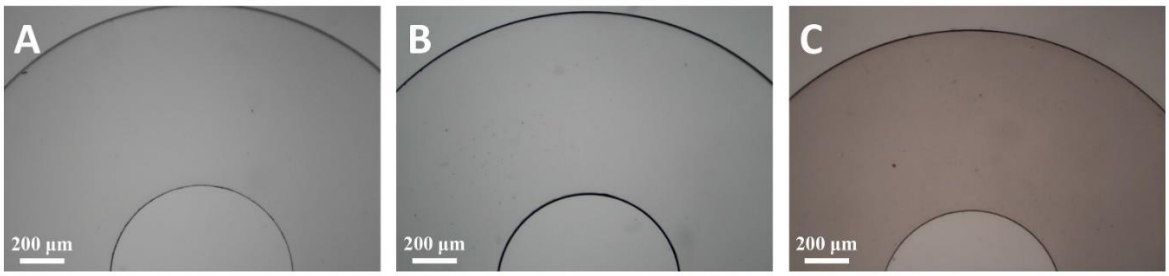

Figure S4. Optical microscopic images of microchannels after each step of the immobilization procedures. (A) Blank PDMS microchannel, which is transparent. (B) APTES-modified microchannel, which is still transparent, but uniform coating thickness is observed on the channel wall. (C) PDA-modified microchannels, which become opaque and brown. The scale bar is 200 μm.

5. SEM images of GIMR microchannels before and after the reaction

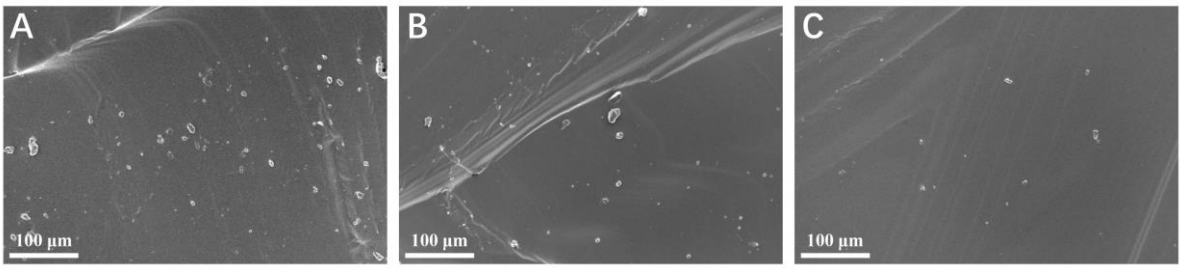

Figure S5. SEM images of GIMR microchannels before and after the reaction. (A) Before the reaction. (B) After the one reaction. (C) After the ten reactions. The number of blocks after the reaction decreased gradually. The scale bar is 100 μm.