Electronic Supplementary Material (ESI) for Lab on a Chip.

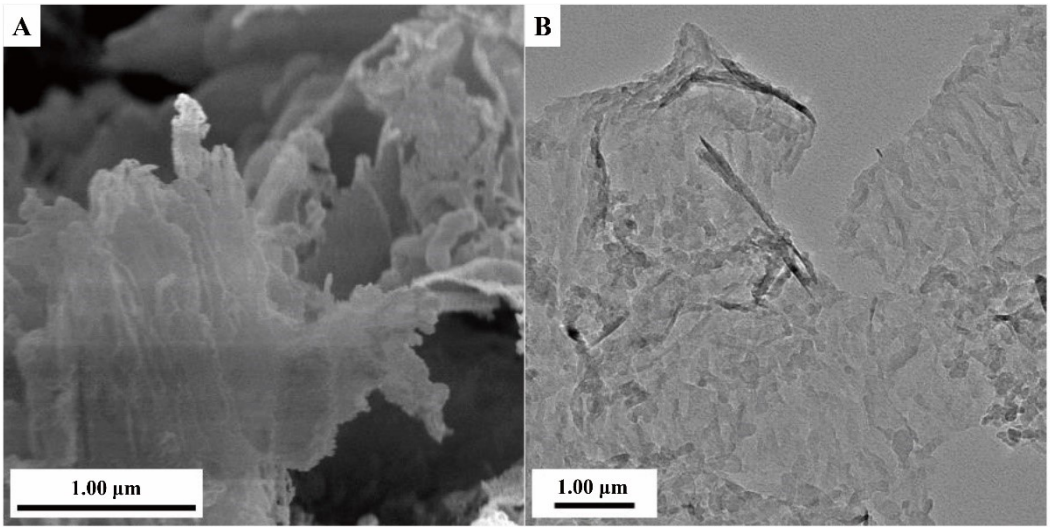
Supplementary Information

A versatile optofluidic microreactor for artificial photosynthesis induced coenzyme regeneration and L-glutamate synthesis

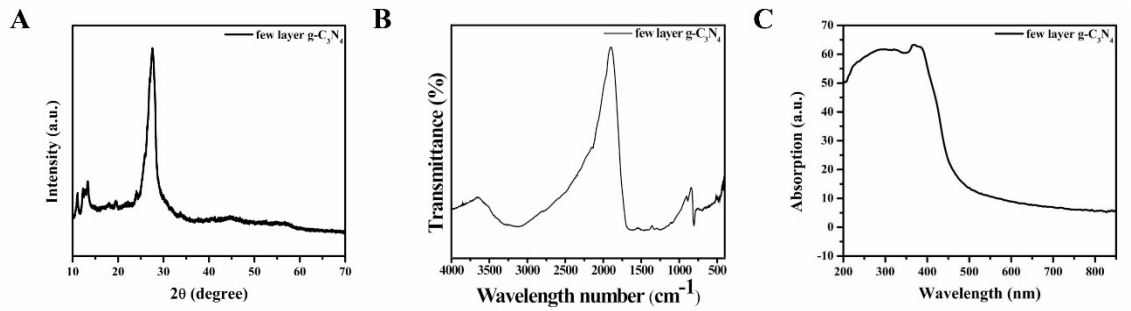
Supplementary Methods

Characterization of few-layer g-C_3N_4

SEM images were collected using scanning electron microscopy (Regulus 8220, HITACHI) at accelerating voltage of 5.0 kV. TEM images were recorded using a transmission electron microscope with an acceleration voltage of 200.0 KV. X-ray diffractometer (XRD, Bruker AXS, D8-ADVANCE). The FTIR spectra were recorded on fourier transform infrared spectroscopy (Thermo Fisher Scientific, Nicolet10). The UV-vis absorbance was measured by UV-vis spectrophotometer (Agilent, 8453).



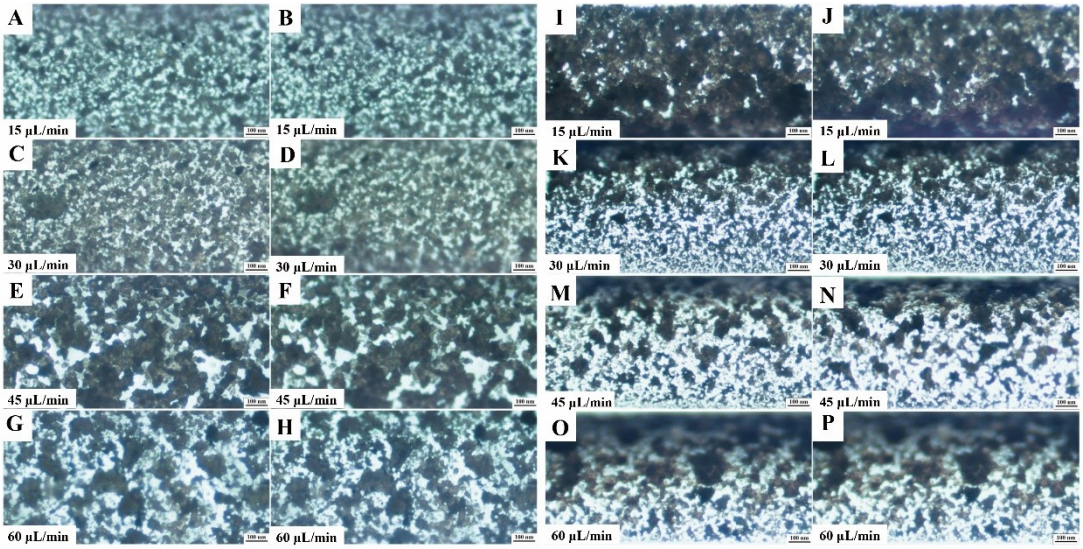
Supplementary Figure 1. **A** SEM and **B** TEM image of few-layer g-C_3N_4.



Supplementary Figure 2. Characterization results of few-layer g-C_3N_4. **A** X-ray powder diffraction (XRD) spectra, **B** Fourier transform infrared (FTIR) spectra and **C** UV-vis absorption spectra.

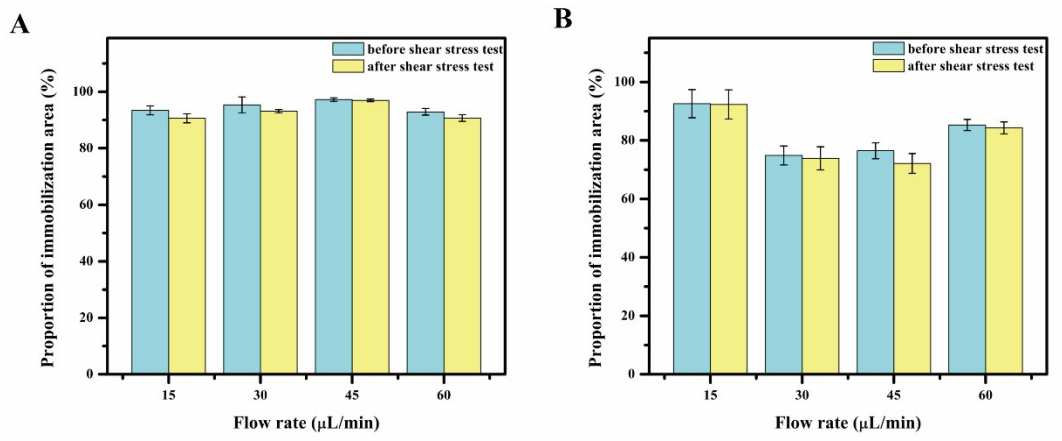
Shear stress tests of FIM and PIM

In order to observed the effect of photocatalytic material immobilization on the inner wall of the glass capillary. The shear stress tests were carried out in FIM and PIM with 15, 30, 45, 60 μL/min. Each FIMs and PIMs were flushed by different flow rate with 10 min. Optical microscope (Nikon, Eclipse E200MV) was employed to record the image of FIM and PIM both before and after shear stress tests. The results were shown as Supplementary Figure 3.



Supplementary Figure 3 **A**, **C**, **E** and **G** The images of FIM before shear tress test. **B**, **D**, **F** and **H** The images of FIM after shear tress test. **I**, **K**, **M** and **O** The images of PIM before shear tress test. **J**, **L**, **N** and **P** The images of FIM after shear tress test.

Image-Pro Plus 6.0 was utilized to calculate the area of photocatalytic material immobilization. Then we calculated the proportion of photocatalytic material immobilization area to total area both before and after shear stress tests. The results were shown as Supplementary Figure 4.



Supplementary Figure 4 The results of shear stress tests in (**A**) FIM and (**B**) PIM. Error bars represent the standard deviations from three independent experiments.

NADH regeneration in microreactors

The relationship of irradiation time and flow velocity is:

$$v = V/t \tag{1}$$

where V is the volume of reaction medium in microreactors; v is the flow velocity of reaction medium; t is irradiation time of reaction medium under Xenon lamp and t was set as 5, 10, 20, 30, 40 min. The volume of all microreactors was the same, approximately 62.8 μL.

Table.S1 Irradiation time and flow velocity

Irradiation time (min)	5	10	20	30	40
Flow velocity (μL/min)	12.5	6.28	3.14	2.09	1.57

Synthesis of L-glutamate in microreactor

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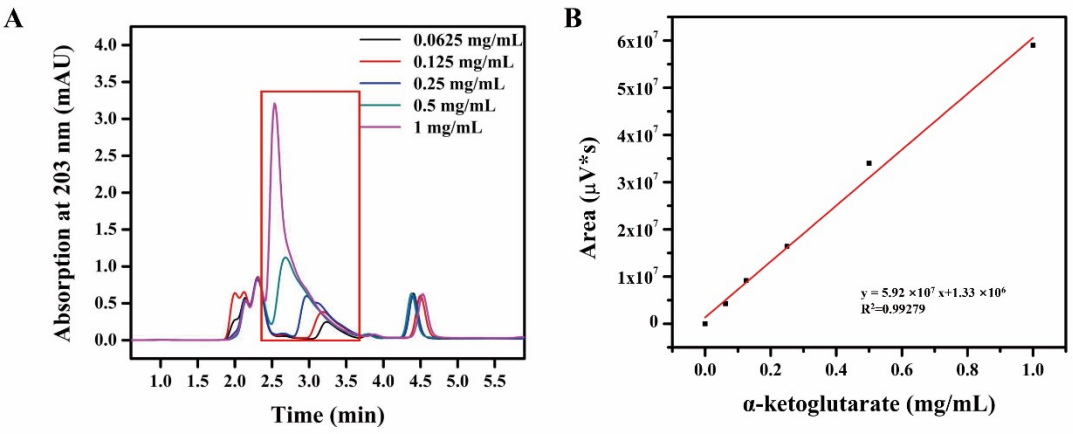

Supplementary Figure 5 A The HPLC peak of α-ketoglutarate in reaction medium was pointed out by the red frame. The concentration of α-ketoglutarate was 0.0625 to 1 mg/mL. **B** The standard curve was analyzed.