

## Supporting information

Fig.S1 shows the three different kinds of flow cells designed and made in our previous study. The diagram and picture shown in Fig.S1(A) was directly using a fluorinated ethylene propylene (FEP) tube (0.8 mm i.d.) as the flow cell, similar as the flow cell reported by Amornthammarong et al. [1]. The background fluorescence signal was high for the stray light and low sensitivity was obtained. Fig.S1(B) shows a “W” type flow cell made of polyetheretherketone (PEEK). The problem of low sensitivity was still existed. Fig.S1(C) shows a customized quartz flow cell. With this flow cell, the signal intensity can be improved. However, large volume of the flow cell (about 1 mL) could seriously affect the height and shape of the signal peak. In addition, this kind of flow cell could not effectively avoid the interference of air bubbles on the fluorescence signal.

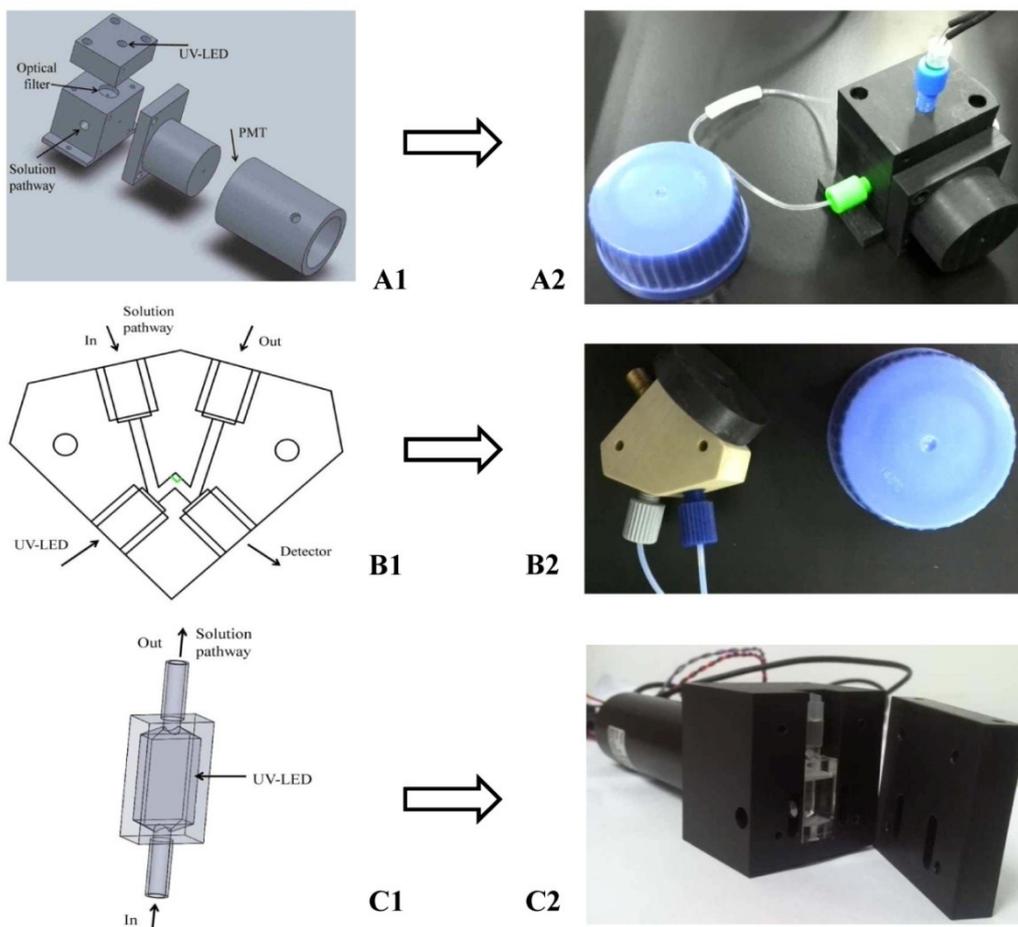


Fig.S1 Diagrams and pictures of the three kind flow cells designed and made in this study

The electronic circuit of the fluorescence detector is shown in Fig.S2. The UV-LED was powered by a constant current supply circuit of 16 mA at a supply voltage of about 3.6 V to ensure the light intensity of the UV-LED. A constant voltage circuit was also designed to provide a constant power supply voltage of 5 V for PMT.

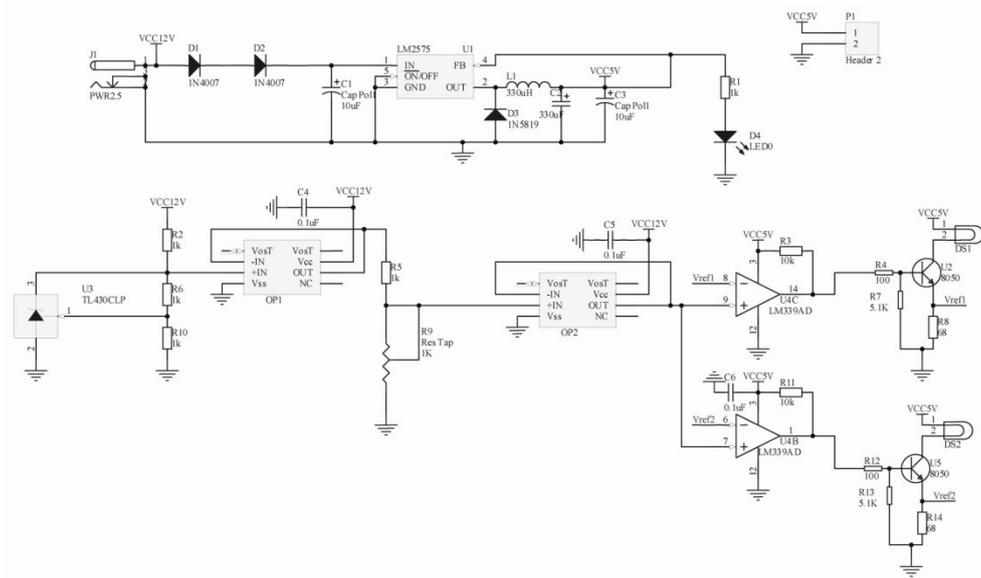


Fig.S2 Electronic circuit of the constant current and voltage supply

The possible affecting factors, including reaction temperature, reagent flow rate, and sample injection volume were investigated, based on a univariate experimental design. A standard solution of  $50 \text{ nmol}\cdot\text{L}^{-1}$  ammonium was used for this parameter optimization experiment. Each sample was quantified three times, and the results shown as an average  $\pm$  the standard deviation (SD,  $n=3$ ).

Fig. S3(A) indicates that increasing temperature accelerates the reaction rate and the blank signal was also increased. The optimal temperature was selected based on a consideration of the net signal, reproducibility and the problem of air bubbles in the detector cell. The net fluorescence signal slowly increased when the reaction temperature was higher than  $65 \text{ }^\circ\text{C}$ . Thus, the optimal temperature of  $65 \text{ }^\circ\text{C}$  was chosen.

The effect of the reagent flow rate was tested by varying the flow rate from  $0.49\text{-}1.15 \text{ mL}\cdot\text{min}^{-1}$ . The result is shown in Fig. S3(B). The signal intensity was improved with a lower flow rate, but a low flow rate could increase dispersion and analysis time. To

balance the signal intensity and peak shape and analysis time, a reagent flow rate of 0.82 mL·min<sup>-1</sup> was selected.

Sample injection volumes between 185 and 450 μL were evaluated for optimization (Fig. S3(C)). The fluorescence signal did not change much when the injection volume was higher than 383 μL, and so 383 μL was chosen as the injection volume.

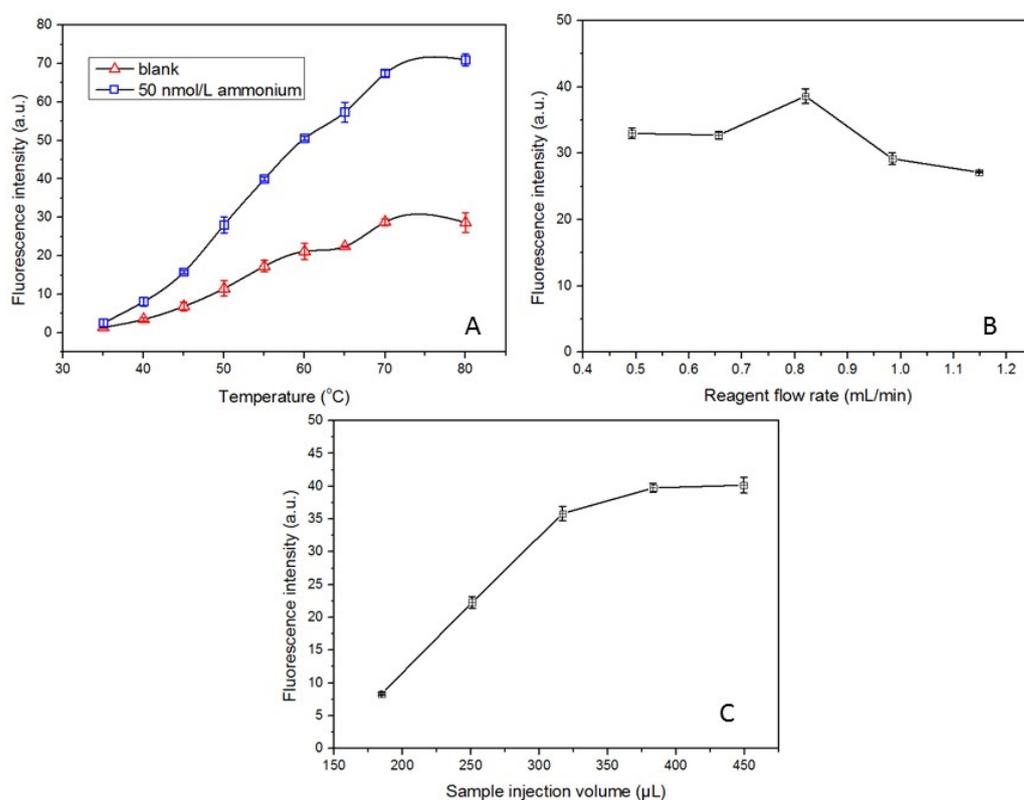


Fig.S3 Influence of the reaction temperature (A), reagent flow rate (B), and sample injection volume (C)

## References

- [1] N. Amornthammarong, J.Z. Zhang, P.B. Ortner, J. Stamates, M. Shoemaker, M.W. Kindel, A portable analyser for the measurement of ammonium in marine waters. *Environ. Sci.: Process. Impacts* 5 (2013) 579-584.