Facile in-situ synthesis of $Ti_3C_2T_x/TiO_2$ nanowires toward simultaneous determination of ascorbic acid, dopamine and uric acid

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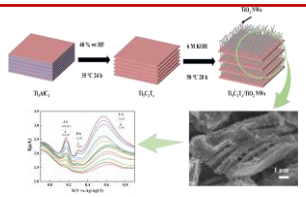
Background

- **Recently, people's concern for life and health has continued to increase, and there is a great need for efficient and accurate detection of small biomolecules in the human body**
- **Mxene due to its excellent electrical conductivity, high hydrophilicity, and good physical and chemical stability has gained attention as a promising material for electrochemical sensors**
- **TiO_2 have demonstrated the ability to enhance the separation peaks among biomolecules**
- **The complicated fabrication processes, associated high cost, and instability continue to hamper the application of electrochemical sensors.**

Methods & Results



Scheme 1. The diagram of the synthesis process of $Ti_3C_2T_x/TiO_2$ NWs

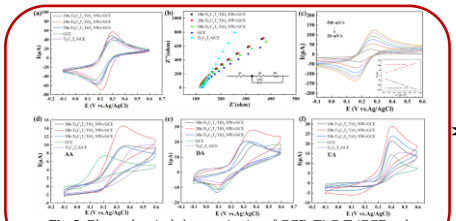


Fig. 3. Electrochemical characterization of GCE, $Ti_3C_2T_x$/GCE and $Ti_3C_2T_x/TiO_2$ NWs/GCE, (a, c, d-f) CV, (b) EIS

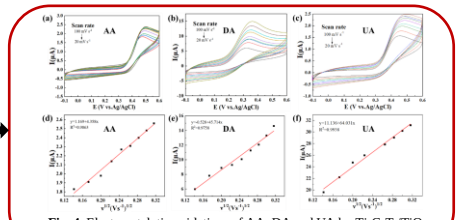


Fig. 4. Electrocatalytic oxidations of AA, DA and UA by $Ti_3C_2T_x/TiO_2$ NWs/GCE, (a-c) CV, (d-f) The linear plots of I *vs.* $v^{1/2}$

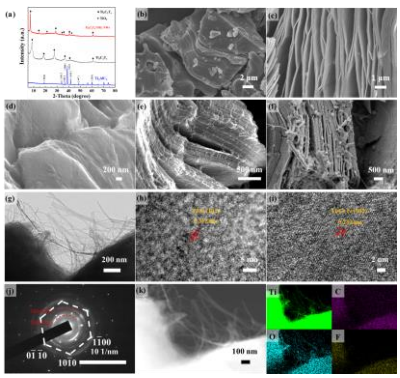


Fig. 1. The characterization of $Ti_3C_2T_x$, $Ti_3C_2T_x$ and $Ti_3C_2T_x/TiO_2$ NWs, (a)XRD, (b-f) SEM, (g-k) TEM

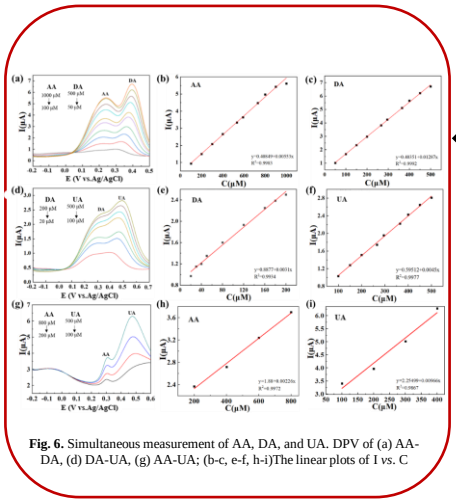


Fig. 6. Simultaneous measurement of AA, DA, and UA. DPV of (a) AA-DA, (d) DA-UA, (g) AA-UA; (b-c, e-f, h-i)The linear plots of I *vs.* C

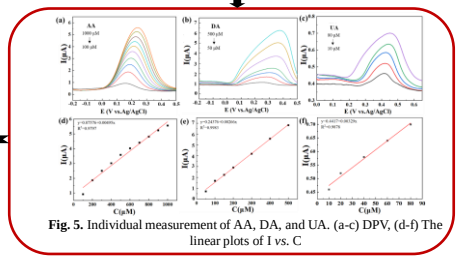


Fig. 5. Individual measurement of AA, DA, and UA. (a-c) DPV, (d-f) The linear plots of I *vs.* C

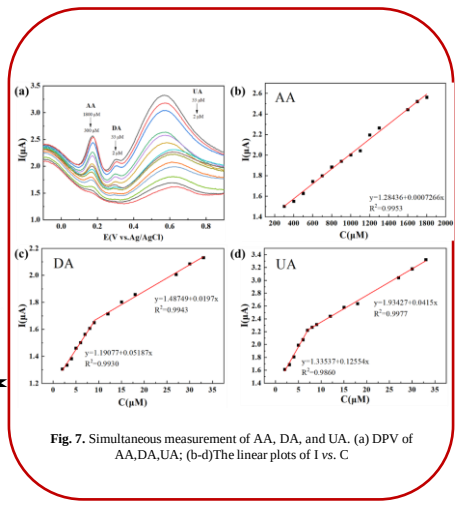


Fig. 7. Simultaneous measurement of AA, DA, and UA. (a) DPV of AA,DA,UA; (b-d)The linear plots of I *vs.* C

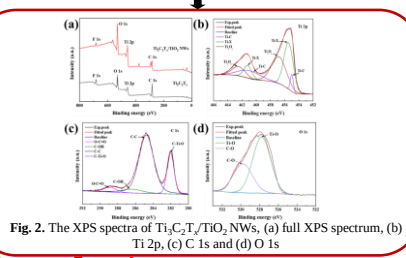


Fig. 2. The XPS spectra of $Ti_3C_2T_x/TiO_2$ NWs, (a) full XPS spectrum, (b) Ti 2p, (c) C 1s and (d) O 1s

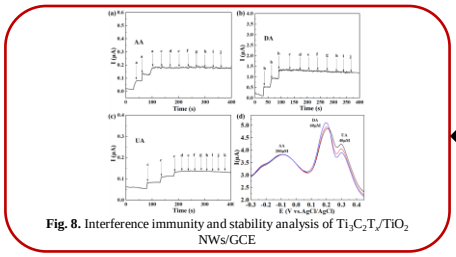


Fig. 8. Interference immunity and stability analysis of $Ti_3C_2T_x/TiO_2$ NWs/GCE

Conclusion

- **The $Ti_3C_2T_x/TiO_2$ NWs modified GCE demonstrated the simultaneous detection of AA (300-1800 μM), DA (2-33 μM), and UA (2-33 μM) with LODs of 66.07 μM (AA), 0.023 μM (DA), and 0.011 μM (UA)**
- **The surface of $Ti_3C_2T_x$ exhibited neutral properties due to the substitution of hydroxyl groups with fluorine groups after alkali treatment**
- **the electrochemical sensor based on $Ti_3C_2T_x/TiO_2$ NWs exhibits exceptional anti-interference ability, stability, and reliable reproducibility**