Supporting Information

Text-S1　Simulated by Visual MINTEQ 3.1

To fit the morphological distribution of chromium at different pH, we chose the multi-problem option and set up to simulate the speciation distribution of hexavalent chromium from pH 1 to 12 in the experimental setting (Initial Cr(VI): 106 mg/L). The increment between values was set to 0.1 and 110 data points on the concentration distribution of main species were obtained.

Text-S2　Calculation of mass transfer rate constant

The mass transfer rate constant (k_m) was calculated using the Eq. (S1) (Zaky and Chaplin, 2013):

$$k_m = \frac{I_{lim}}{zFAC} \quad , \qquad \text{(S1)}$$

where limiting current (I_{lim}), z is the number of electrons transferred, F is the Faraday constant, A is the surface area (m^2) and C is the concentration of reactant (mol/m^3).

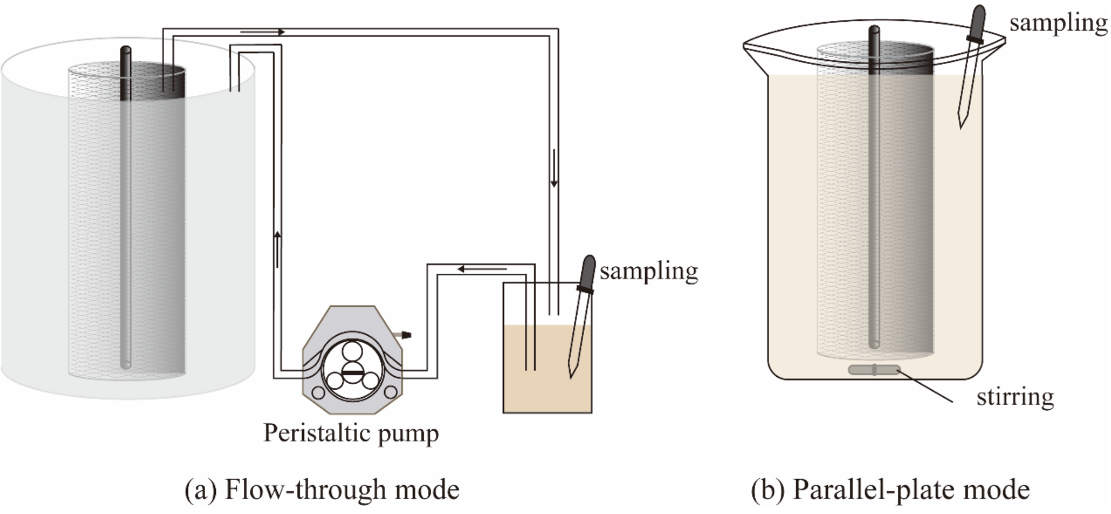

Fig. S1　Schematic of flow-through mode and parallel-plate mode. (a) flow-through mode; (b) parallel-plate mode.

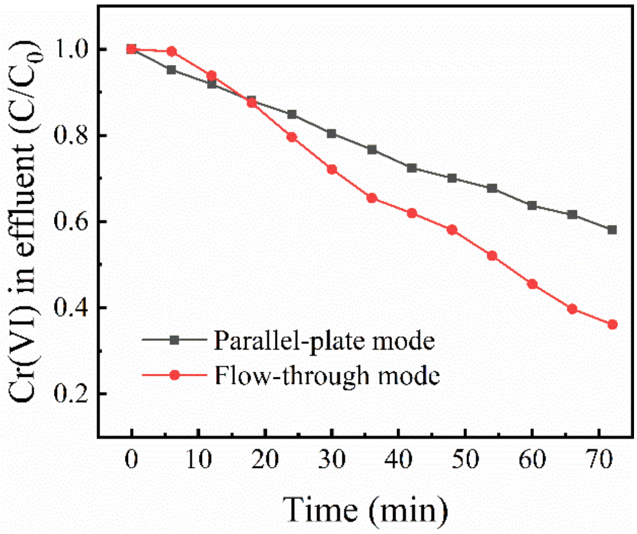

Fig. S2 Cr(VI) reduction performance under flow-through mode and parallel-plate mode. Conditions: initial pH 2.0 and 106 mg/L Cr(VI), voltage of 5.0 V.

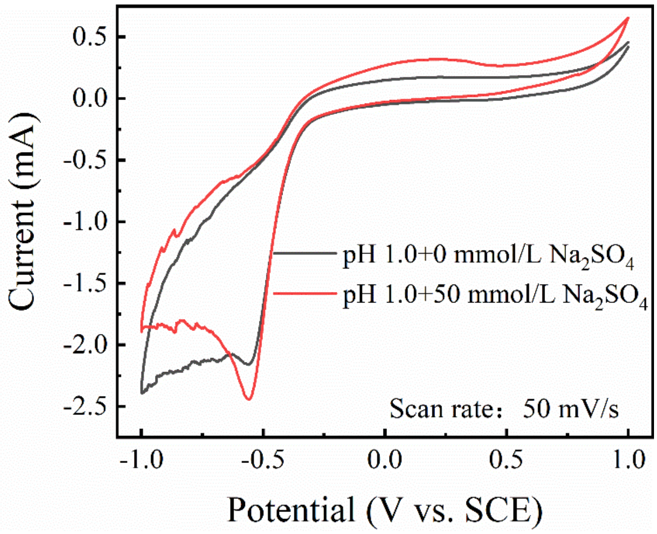

Fig. S3 Cyclic voltammogram for Ti electrode in pH 1.0 and 106 mg/L Cr(VI) solution with addition of 50 mmol/L Na_2SO_4 and without addition of Na_2SO_4.

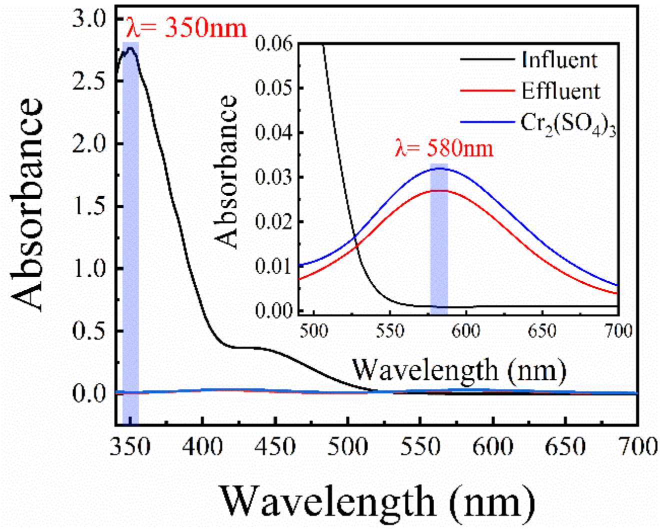

Fig. S4 UV spectrum of influent and effluent at wavelength of 340 nm–700 nm (initial pH 2.0 and 106 mg/L Cr(VI)).

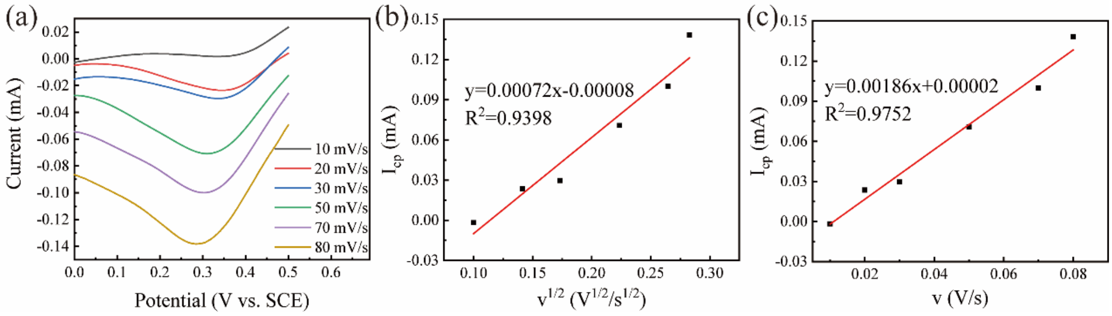

Fig. S5 (a) Cyclic voltammogram (Potential window: 0.0 V to 0.5 V *vs* SCE) for Ti electrode in the 106 mg/L Cr(VI) solution with a pH 2.0 and 50 mmol/L Na_2SO_4; (b) linear relationship between peak current and square roots of scan rate ($v^{1/2}$); (c) linear relationship between peak current and scan rate (v).

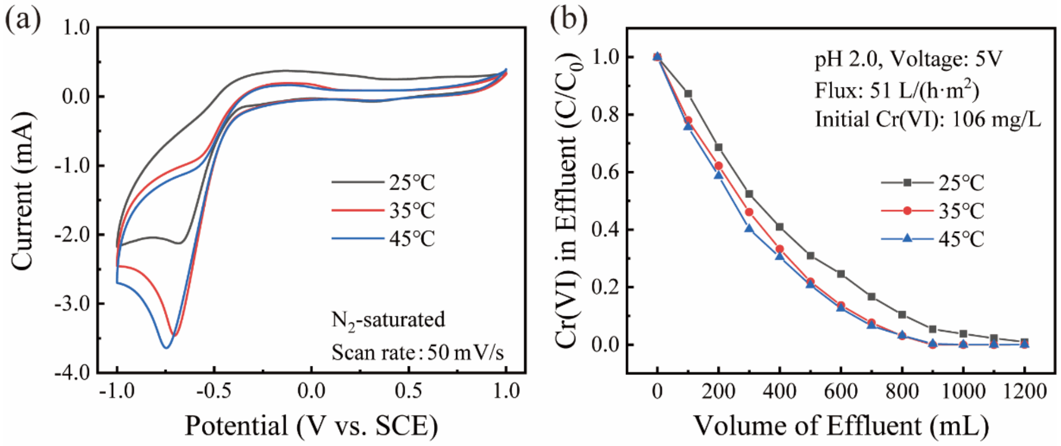

Fig. S6 Effect of temperature on Cr(VI) electroreduction. (a) CV for Ti electrode in 106 mg/L Cr(VI) and 50 mmol/L Na_2SO_4 solution at pH 2.0; (b) efficiency in single-pass flow-through test.

References

Zaky A M, Chaplin B P (2013). Porous substoichiometric TiO_2 anodes as reactive electrochemical membranes for water treatment. Environmental Science & Technology, 47(12): 6554–6563