Supplementary Information for:

Relationship between the molecular structure of V$_2$O$_5$/TiO$_2$ catalysts
and the reactivity of SO$_2$ oxidation

Authors: Peidong Ji$^a$, Xiang Gao$^a$, *, Xuesen Du$^{a,b}$, Chenghang Zheng$^b$, Zhongyang Luo$^a$, Kefa Cen$^a$

Affiliations: $^a$State Key Laboratory of Clean Energy Utilization, Zhejiang University, Hangzhou 310027, China

$^b$Key Laboratory of Low-grade Energy Utilization Technologies & Systems of Ministry of Education of China, College of Power Engineering, Chongqing University, Chongqing 400044, China

Xiang Gao * (corresponding author),
Address: State Key Laboratory of Clean Energy Utilization, Zhejiang University, No.38 Zheda Road, Hangzhou, Zhejiang PRC 310027 P.R., China.
Tel: +86-13505711887
Fax: +86-571-87951616
Email: xgao1@zju.edu.cn
The temperature dependence of the oxidation of SO\textsubscript{2} to SO\textsubscript{3} was investigated as shown in Fig. S1. The SO\textsubscript{2} oxidation reaction rates over V\textsubscript{2}O\textsubscript{5}/TiO\textsubscript{2} catalysts were calculated in the temperature range 300-400 °C, where the SO\textsubscript{2} conversion is less than 20%. The data were analyzed by assuming a simplified plug-flow reactor model and a rate equation first order in SO\textsubscript{2} and zero order in O\textsubscript{2}. According to the pseudo-first-order rate constant of SO\textsubscript{2} oxidation, \( k_{\text{SO}_2} \), can be expressed as follows \textsuperscript{1}:

\[
k_{\text{SO}_2} = -\frac{Q}{V_c} \left( \frac{T + 273}{273} \right) \ln(1 - X_{\text{SO}_2})
\]

where \( Q \) is the total gas flow rate (ml/s (NTP)), \( V_c \) is the total catalyst volume (ml), and \( X_{\text{SO}_2} \) is the SO\textsubscript{2} conversion.

![Fig. S1. SO\textsubscript{2} conversion of V\textsubscript{2}O\textsubscript{5}/TiO\textsubscript{2} catalysts as a function of vanadia loading and reaction temperature.](image-url)
Fig. S2. Arrhenius plots of the SO$_2$ oxidation reaction rates of V$_2$O$_5$/TiO$_2$ catalysts with different vanadia loading.

Fig. S3. Activation Energy of SO$_2$ oxidation of V$_2$O$_5$/TiO$_2$ catalysts with different vanadia loading.

References: