Supplementary Material

Mechanism of birnessite-promoted oxidative dissolution of antimony trioxide

Jun Shan,[A] *Xintong Ding*,[A] *Mengchang He*,[A,B] *Wei Ouyang*,[A] *Chunye Lin*[A] *and Xitao Liu*[A]

[A]State Key Laboratory of Water Environment Simulation, School of Environment, Beijing Normal University, Beijing 100875, China.

[B]Corresponding author. Email: hemc@bnu.edu.cn

S1. Synthesized method of birnessite.

KMnO$_4$ (500 mL, 0.4 mol/L), used as a precursor, was heated to boiling. During the heating process, a mixed solution made by 35 mL concentrated hydrochloric acid and 15 mL water was added dropwise while stirring. The mixture was kept boiling for 30 min after the dropping process was finished. After the reaction finished, the mixture was cooled to room temperature and aged for 12 hours. Then, the precipitate was isolated by high-speed centrifugation, rinsed several times with deionized water until no Cl$^-$ existed and freeze-dried and sieved to a 100 mesh powder, thus yielding the birnessite.

S2. Accuracy verification of antimony determination method

The accuracy of the used Sb(III), Sb(tot) and Sb(V) determination method have been evaluated by standard addition method and compared the results with that of LC-HG-AFS method. The results are shown in **Table S1**. Antimony trioxide (Alfa Aesar Co., Tianjin, China) and potassium pyroantimonate (Sinopharm Chemical Reagent Co. Ltd., Shanghai, China) were used to prepare standard solutions for Sb(III) and Sb(V), respectively. In both methods, determined Sb(III) was lower and determined Sb(V) is higher than the standard addition concentrations, which may be caused by partial oxidation of Sb(III) in the process of preparing the stock solution. By comparing the determination results between the two methods, it can be found that the difference between the two methods in the tested concentrations are all less than 5%, indicating that the method recommended in this paper is feasible.

Table S1. The results of Sb species analysis through standard addition by different analysis methods. All measurements were made in triplicate, and the results were averaged.

Methods	Standard addition (μg/L)	Detected Sb (μg/L)	R (%)
HG-AFS	Sb(III) = 10.00	Sb(III) = 9.57±0.20	95.7
	Sb(V) = 30.00	Sb(tot) = 41.21±1.26	103.0
		Sb(V)=Sb(tot)-Sb(III)=31.64	105.5
	Sb(III) = 30.00	Sb(III) = 28.22±1.00	94.1
	Sb(V) = 10.00	Sb(tot) = 39.73±0.72	99.3
		Sb(V)=Sb(tot)-Sb(III)=11.51	115.1
LC-HG-AFS	Sb(III) = 10.00	Sb(III) = 9.24±0.06	92.4
	Sb(V) = 30.00	Sb(V) = 31.78±0.62	105.9
		Sb(tot)=Sb(III)+Sb(V)=41.02	102.6
	Sb(III) = 30.00	Sb(III) = 29.02±0.76	96.7
	Sb(V) = 10.00	Sb(V) = 12.04±0.56	120.4
		Sb(tot)=Sb(III)+Sb(V)=41.76	102.7