

*Supplementary Information for*

**Treatment of Electrochemical Plating Wastewater by  
Heterogeneous Photocatalysis: The Simultaneous  
Removal of 6:2 Fluorotelomer Sulfonate and  
Hexavalent Chromium**

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**Table S1.** BET surface area of the as received photocatalysts.

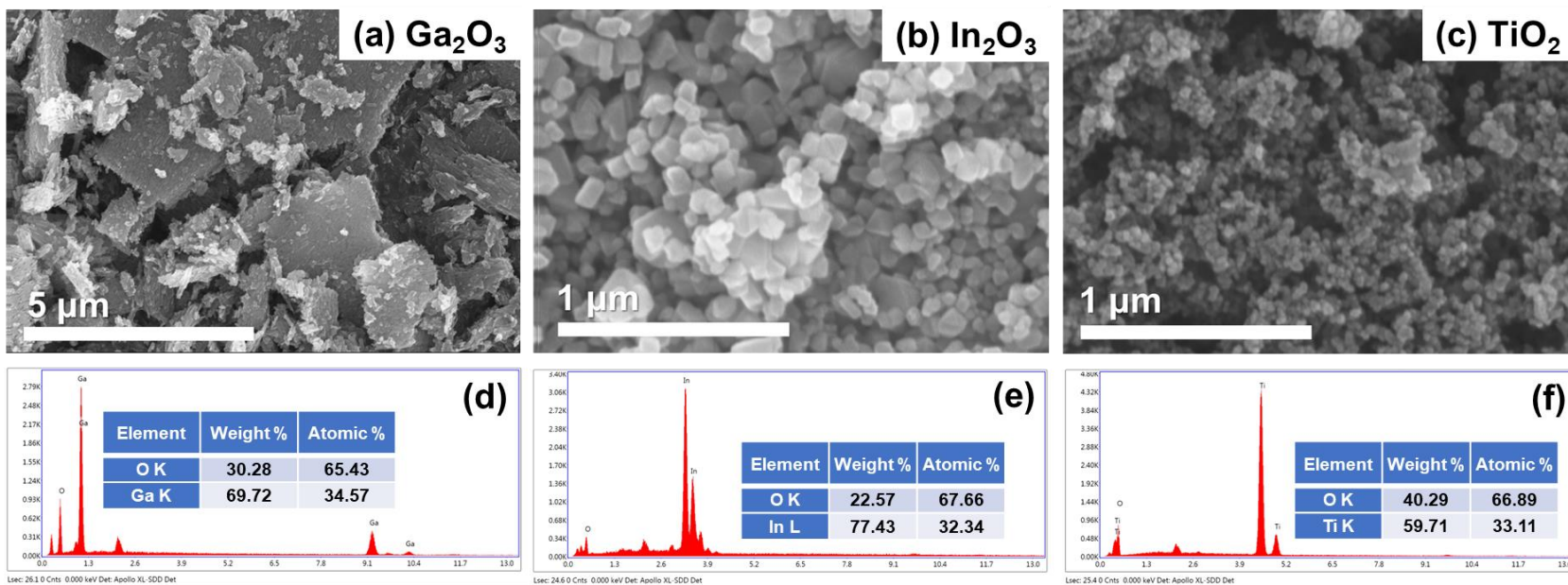
<b>Photocatalyst</b>	<b>BET Surface area (m<sup>2</sup>/g)</b>
Ga <sub>2</sub> O <sub>3</sub>	19.5
In <sub>2</sub> O <sub>3</sub>	7.1
TiO <sub>2</sub>	51.9

**Table S2.** Formula and molecular weight of investigated PFASs.

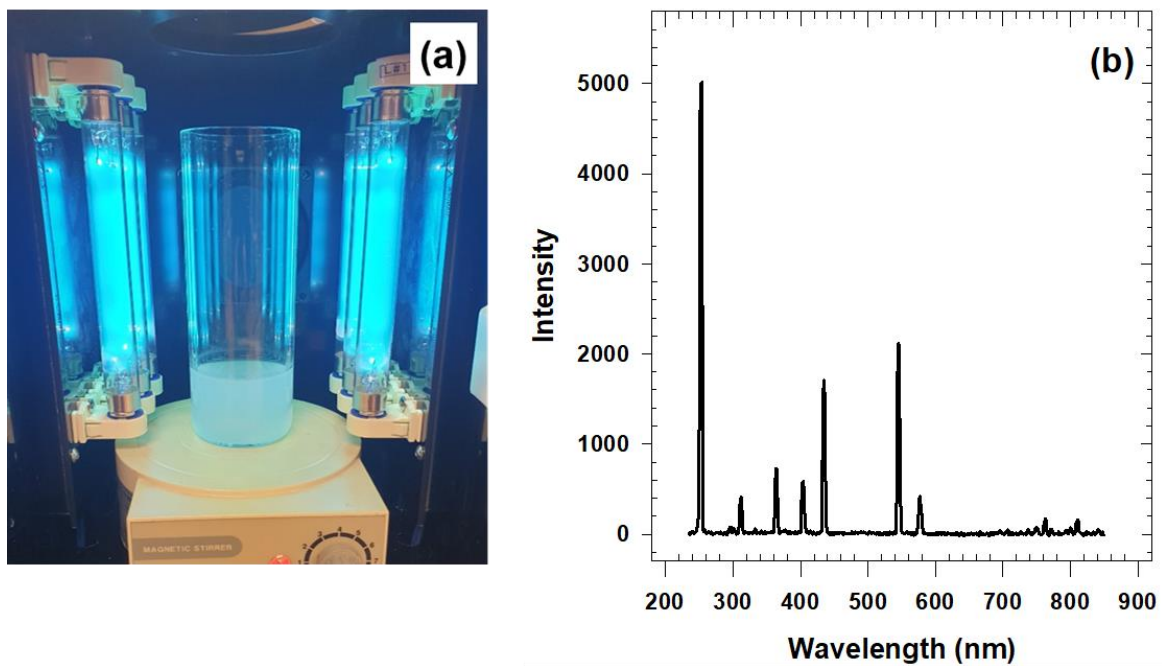
<b>Chemical</b>	<b>Abbreviation</b>	<b>Formula</b>	<b>Molecular weight (g/mol)</b>
6:2 Fluorotelomer sulfonate	6:2 FtS	$C_6F_{13}CH_2CH_2SO_3H$	428.16
6:2 Fluorotelomer carboxylate	6:2 FtCA	$C_6F_{13}CH_2COOH$	378.09
Perfluoroheptanoate	PFHpA	$C_6F_{13}COOH$	364.06
Perfluorohexanoate	PFHxA	$C_5F_{11}COOH$	314.05
Perfluoropentanoate	PFPeA	$C_5F_9COOH$	264.05
Perfluorobutanoate	PFBA	$C_4F_7COOH$	214.04

**Table S3.** Quantitative analytical method.

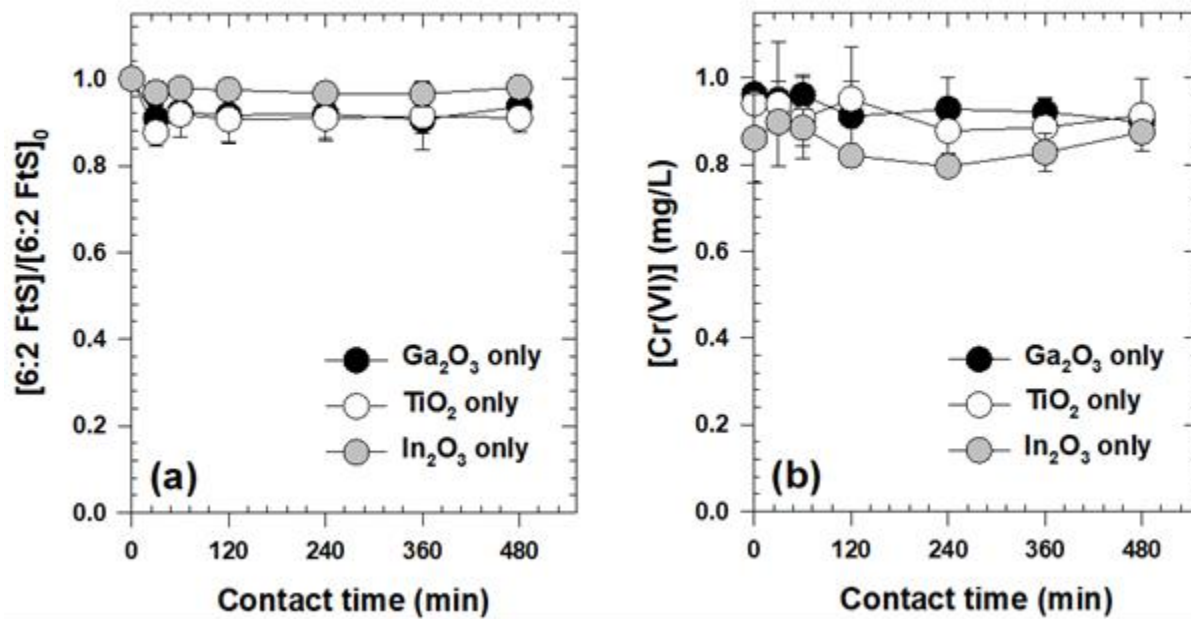
<b>Instrument</b>	Shimadzu LCMS-8030 Triple Quadrupole Mass Spectrometer				
<b>Ionization</b>	Negative electrospray				
<b>Precolumn</b>	Guard Column Thermo Scientific™ Acclaim 120 Å C18, 4.6 x 10 mm, 5 µm				
<b>Column</b>	Agilent Infinity Lab Poroshell 120 Å EC-C18, 3.0 x 50 mm, 2.7 µm				
<b>Column oven temperature</b>	30°C				
<b>Injection</b>	30 µL				
<b>Mobile phases</b>	A: 5 mM ammonium acetate in LCMS grade water B: LCMS grade Methanol				
<b>Flow rate</b>	0.5 mL/min				
<b>Gradient profile</b>	<b>Time (min)</b>	<b>Eluent A Conc. (%)</b>	<b>Eluent B Conc. (%)</b>		
	0	60	40		
	0.5	60	40		
	4.5	20	80		
	10	20	80		
	10.5	60	40		
	13.5	Stop			
<b>Monitored ion transitions</b>	<b>Analytes</b>	<b>Ion transitions</b>	<b>Internal standards</b>	<b>Ion transitions</b>	<b>Calibration range (µg/L)</b>
	6:2 FtS	427 > 407	[ <sup>13</sup> C <sub>2</sub> ]M6:2FtS	429 > 81	0.05 - 20
	6:2 FtCA	377 > 293	[ <sup>13</sup> C <sub>2</sub> ]M6:2FtCA	379 > 294	0.05 - 20
	PFHpA	363 > 319	[ <sup>13</sup> C <sub>4</sub> ]MPFHpA	367 > 322	0.05 - 20
	PFHxA	313 > 629	[ <sup>13</sup> C <sub>5</sub> ]MPFHxA	315 > 270	0.05 - 20
	PFPeA	263 > 219	[ <sup>13</sup> C <sub>5</sub> ]MPFPeA	268 > 223	0.25 - 20
	PFBA	213 > 169	[ <sup>13</sup> C <sub>4</sub> ]MPFBA	217 > 172	0.25 - 20



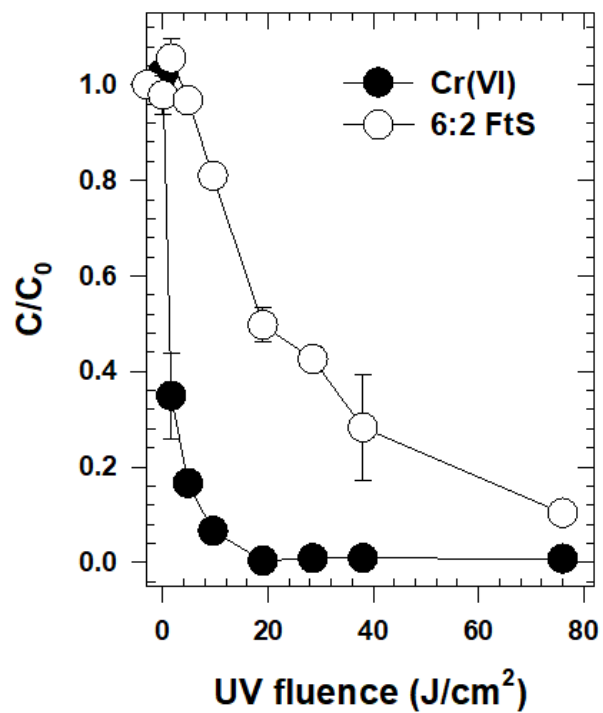
**Figure S1.** SEM images and EDS analyses of the as received photocatalysts.



**Figure S2.** (a) photograph of the 4W UV-C lamp-equipped photoreactor box and (b) intensity of UV-C light (6 units) versus wavelength.

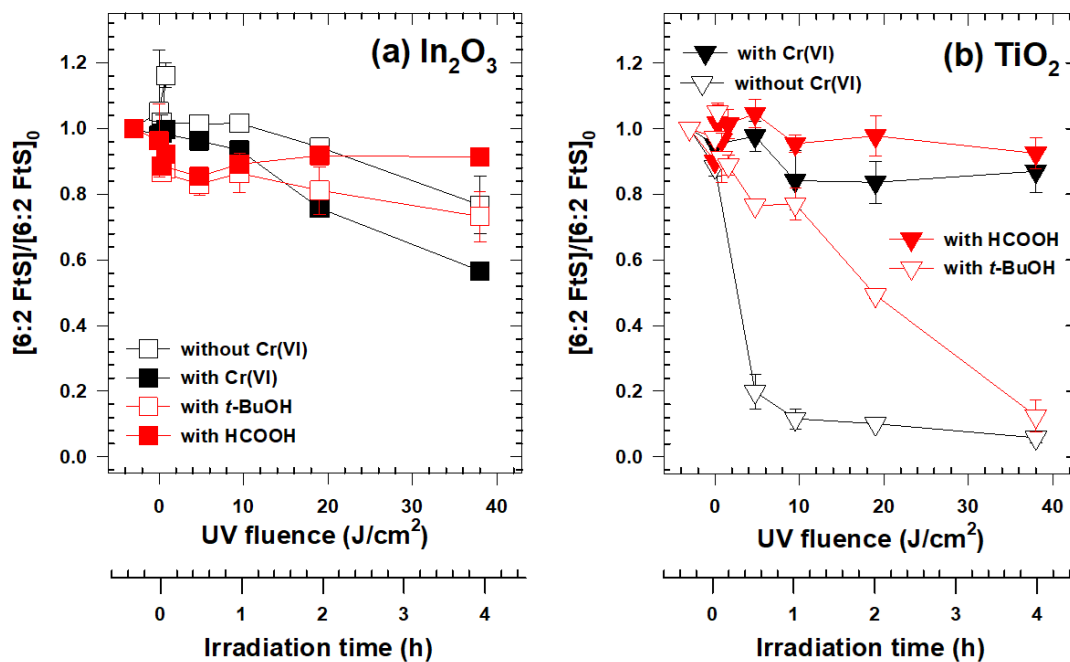


**Figure S3.** The removals of 6:2 FtS (a) and Cr(VI) (b) by Ga<sub>2</sub>O<sub>3</sub>, In<sub>2</sub>O<sub>3</sub>, and TiO<sub>2</sub> photocatalysts in the absence of light. [catalyst]=0.5 g/L, [6:2 FtS]<sub>0</sub> = 100 μg/L, [Cr(VI)]<sub>0</sub> = 1 mg/L, pH = 3.0 ± 1.

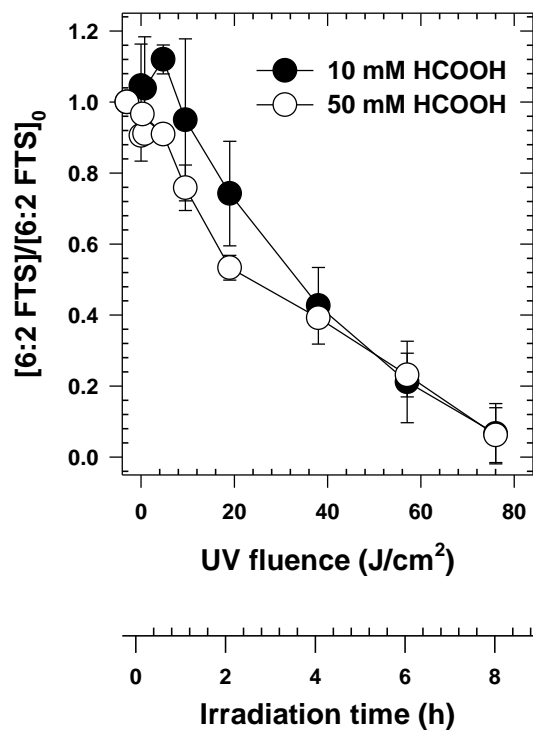


**Figure S4.** The removals of 6:2 FtS and Cr(VI) by UV-C/ $Ga_2O_3$  system.  $[Ga_2O_3] = 0.5$  g/L,  $[6:2 FtS]_0 = 2$  mg/L,  $[Cr(VI)]_0 = 20$  mg/L,  $pH = 3.0 \pm 1$ .

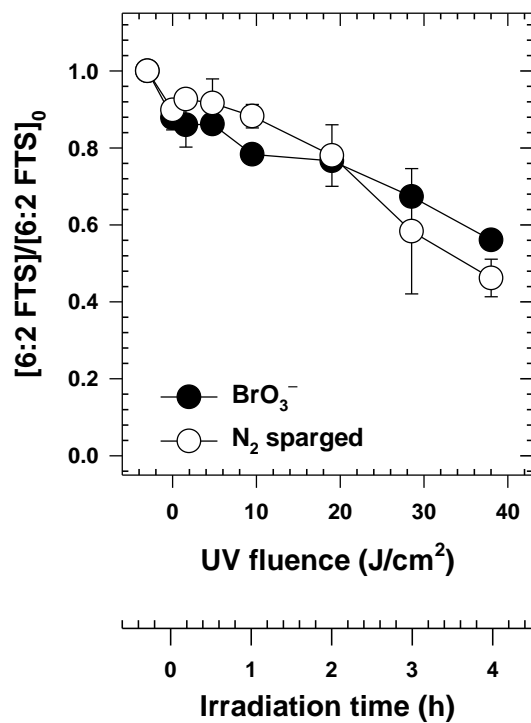




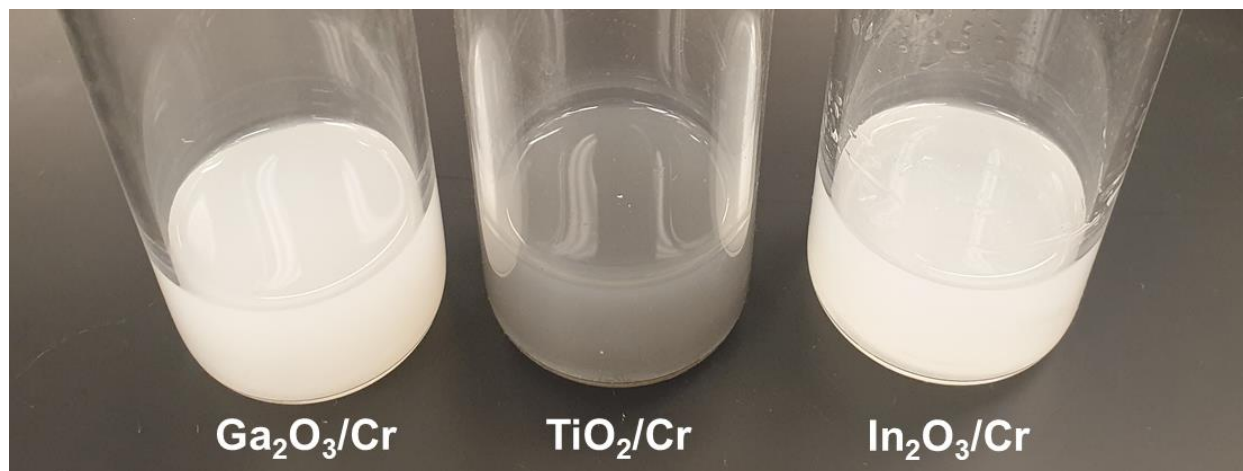
**Figure S5.** Nature of reactive species produced in the (a) UV-C/In<sub>2</sub>O<sub>3</sub>, and (b) UV-C/TiO<sub>2</sub> system. ([In<sub>2</sub>O<sub>3</sub>]<sub>0</sub> = [TiO<sub>2</sub>]<sub>0</sub> = 0.5 g/L (surface area-based doses: [In<sub>2</sub>O<sub>3</sub>] = 3.57 m<sup>2</sup>/L, [TiO<sub>2</sub>] = 25.94 m<sup>2</sup>/L), [6:2 FtS]<sub>0</sub> = 100 μg/L, [Cr(VI)] = 1 mg/L, [MeOH]<sub>0</sub> = 0.3 mM, pH<sub>i</sub> = 3, [*t*-BuOH]<sub>0</sub> = [HCOOH]<sub>0</sub> = 10 mM, Pre-sorption time = 60 min).



**Figure S6.** Effect of HCOOH doses on the degradation of 6:2 FtS by the UV-C/Ga<sub>2</sub>O<sub>3</sub> in the presence of Cr(VI). ([Ga<sub>2</sub>O<sub>3</sub>]<sub>0</sub> = 0.5 g/L (surface area-based dose: 9.76 m<sup>2</sup>/L), [6:2 FtS]<sub>0</sub> = 100 μg/L, [Cr(VI)] = 1 mg/L, [MeOH]<sub>0</sub> = 0.3 mM, pH<sub>i</sub> = 3, Pre-sorption time = 60 min).



**Figure S7.** Effects of bromate or N<sub>2</sub> sparging on the degradation of 6:2 FtS by the UV-C/Ga<sub>2</sub>O<sub>3</sub> system. ([Ga<sub>2</sub>O<sub>3</sub>]<sub>0</sub> = 0.5 g/L (surface area-based dose: 9.76 m<sup>2</sup>/L), [6:2 FtS]<sub>0</sub> = 100 μg/L, [MeOH]<sub>0</sub> = 0.3 mM, [BrO<sub>3</sub><sup>-</sup>]<sub>0</sub> = 10 mM, pH<sub>i</sub> = 3, Pre-sorption time = 60 min)



**Figure S8.** Photographs of  $\text{Ga}_2\text{O}_3/\text{Cr}$ ,  $\text{TiO}_2/\text{Cr}$ , and  $\text{In}_2\text{O}_3/\text{Cr}$  suspensions after 8 h UVC irradiation, respectively. ( $[\text{Ga}_2\text{O}_3]_0 = [\text{TiO}_2]_0 = [\text{In}_2\text{O}_3]_0 = 0.5 \text{ g/L}$  (surface area-based doses:  $[\text{Ga}_2\text{O}_3] = 9.76 \text{ m}^2/\text{L}$ ,  $[\text{In}_2\text{O}_3] = 3.57 \text{ m}^2/\text{L}$ ,  $[\text{TiO}_2] = 25.94 \text{ m}^2/\text{L}$ ),  $[\text{6:2 FtS}]_0 = 100 \text{ }\mu\text{g/L}$ ,  $[\text{Cr(VI)}] = 1 \text{ mg/L}$ ,  $[\text{MeOH}]_0 = 0.3 \text{ mM}$ ,  $\text{pH}_i = 3$ , Pre-sorption time = 60 min).

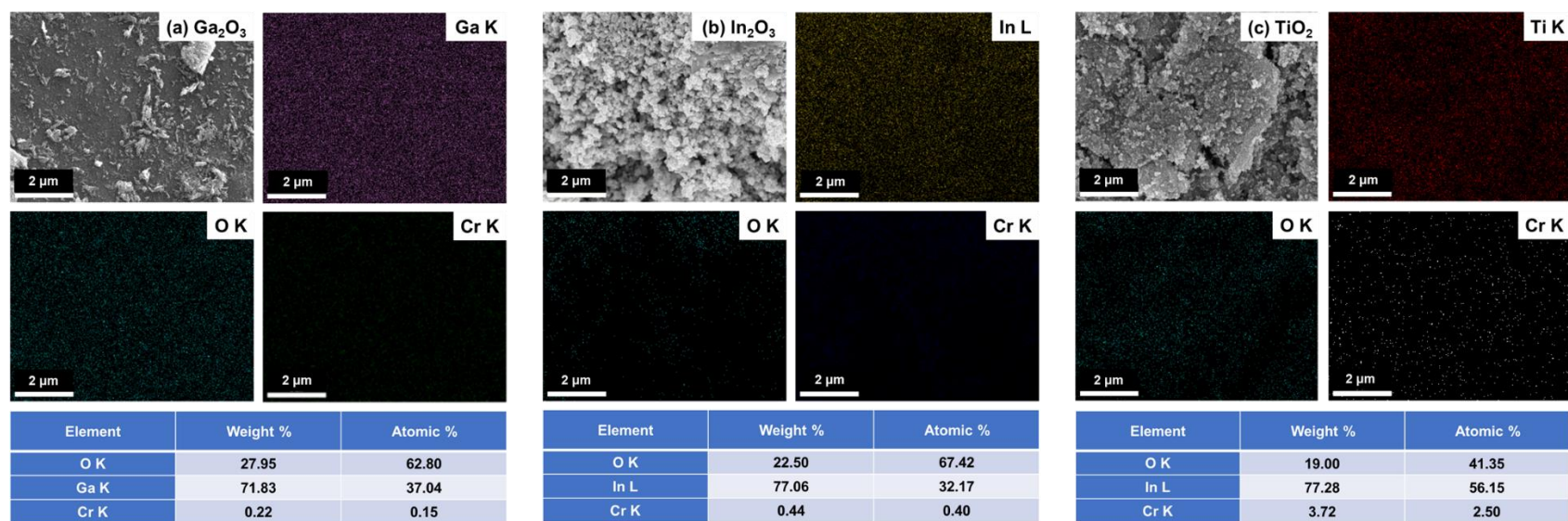


Figure S9. SEM/EDS images of the spent catalysts.