Supporting Information

for

A Ferroelectric Photocatalyst $Ag_{10}Si_4O_{13}$ with Visible-light Photooxidation Properties

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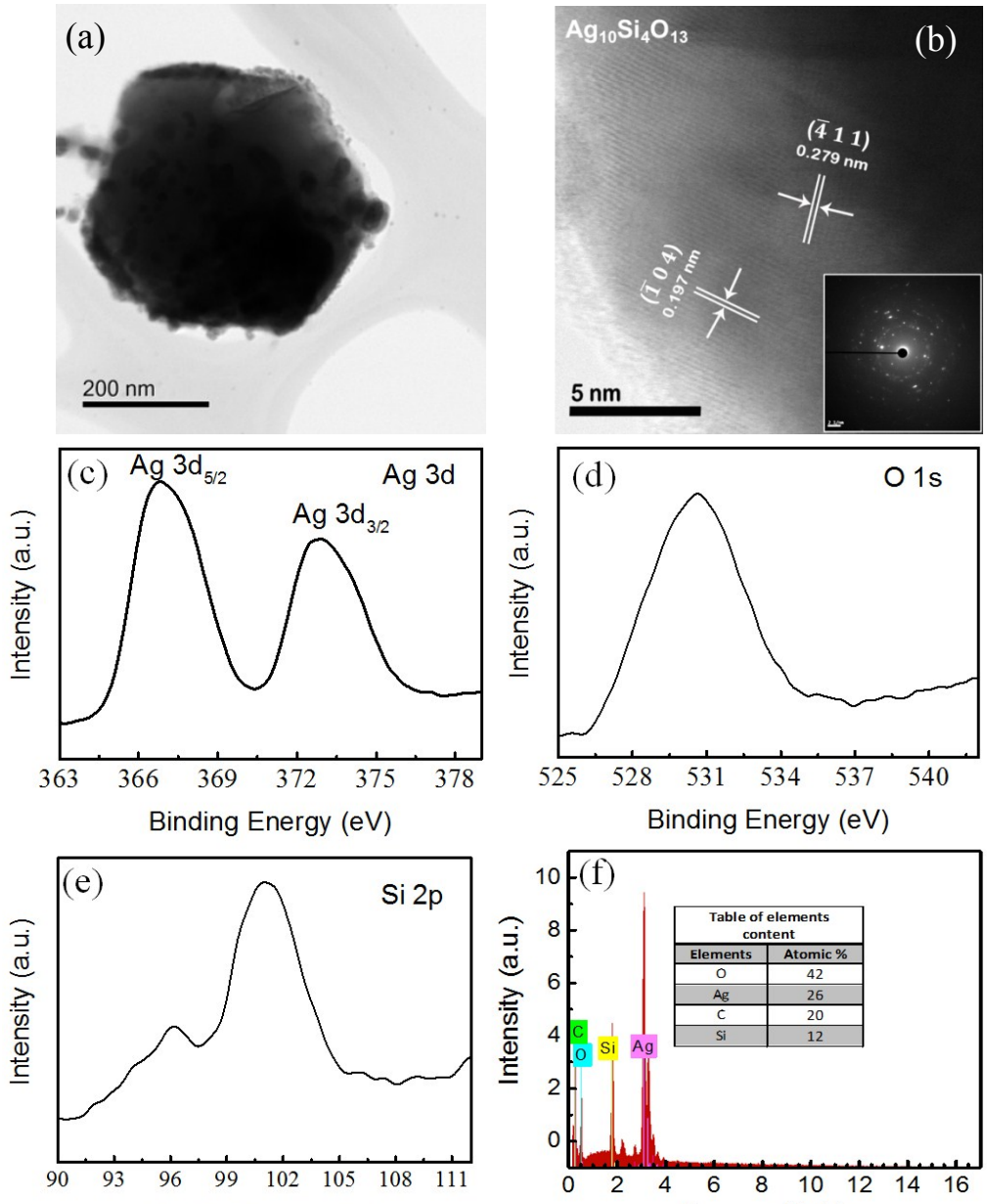

Figure S1. (a) TEM image and (b) HETEM image and inset SAED pattern. XPS spectra of $Ag_{10}Si_4O_{13}$: (c) Ag 3d, (d) O 1s, (e) Si 2p. The spectra demonstrate that the main peaks correspond to Ag 3d5/2 and Ag 3d3/2, O 1s, and Si 2p orbitals for the $Ag_{10}Si_4O_{13}$; (f) EDS spectrum of elements and the inset is a table of elements content percentage corresponding to the $Ag_{10}Si_4O_{13}$.

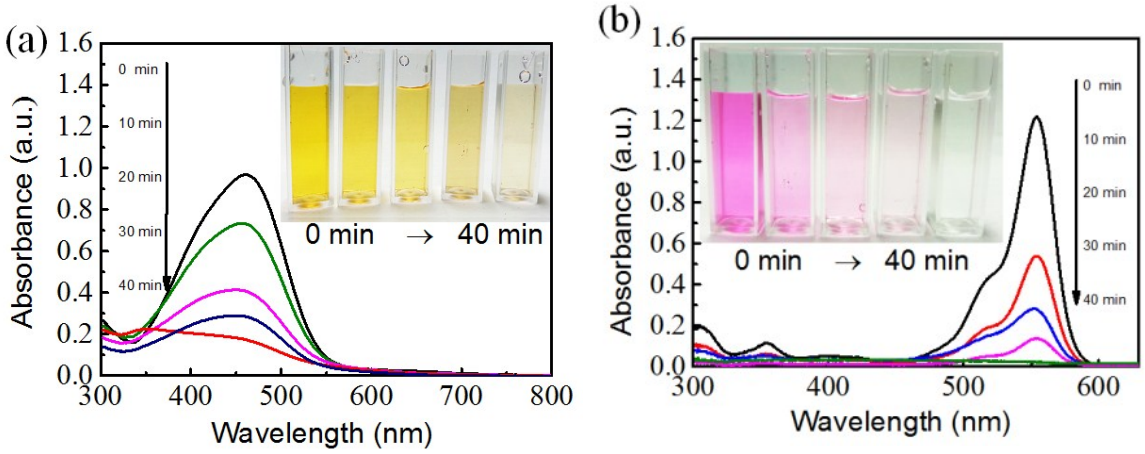

Figure S2. UV-Visible absorbance spectra for the photodegradation of (a) MO and (b) RhB under visible light over $Ag_{10}Si_4O_{13}$ recorded after different degradation times. The insets shows the color changes of the MB (a) and RhB (b) solutions corresponding to the five degradation times from 0 min to 40 min.

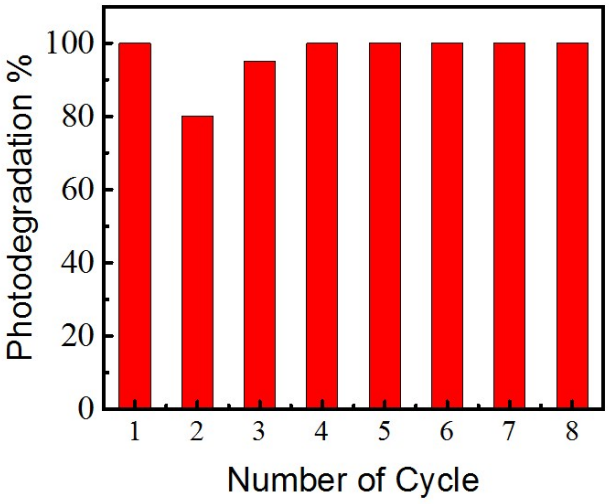

Figure S3. Cycling runs in the photodegradation of RhB over $Ag_{10}Si_4O_{13}$.

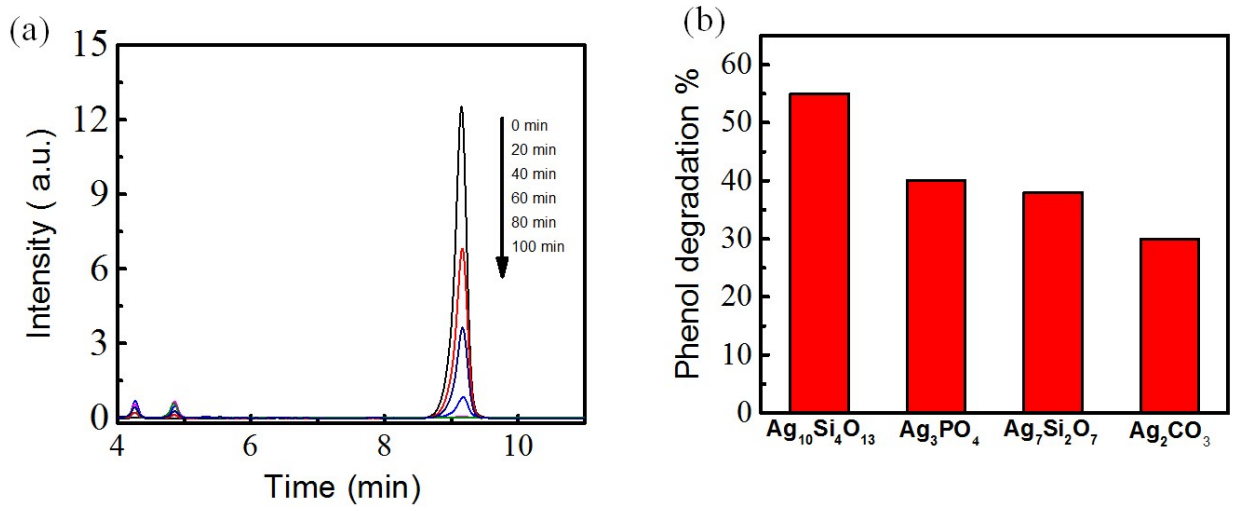

Figure S4. (a) High performance liquid chromatography (HPLC) spectra of phenol under visible light over $Ag_{10}Si_4O_{13}$ (b) Photodegradation of phenol within 20 min over different Ag-incorporated p-block photocatalysts.
References : Ag_2CO_3[1], Ag_3PO_4[2], $Ag_7Si_2O_7$[3], $Ag_{10}Si_4O_{13}$ our work

Parameter for photocatalytic degradation with $Ag_{10}Si_4O_{13}$ as photocatalyst				
	MB	**MO**	**RhB**	**phenol**
K (s^{-1})	6	2.68	5.7	2
C_0^* (µmol) × K (s^{-1})	7.5	8	11.8	42.4
Incident photons (µmol. s^{-1})	958.4			
Apparent quantum efficiency %**	0.78	0.83	1.23	4.4

Table 1. The apparent quantum efficiency (QE) for different organic components.

*C_0 initial concentration 1 mg for MO, Mb, RhB and 2 mg for phenol in 100ml of water.

**The apparent quantum efficiency (QE) was measured under the same photocatalytic reaction condition under visible light 420-770 nm for 300 W Xe lamp by using cut-off filters and, the distance was 10 cm between the light source and the surface of solution with area 38.46 cm^2, the light intensity was 150 mW/cm^2 which was measured by using optical powermeter. the QE was calculated according to Eq.[4-6] (1):

$$QE(100\%) = \frac{degradation\ rate\ of\ \ organic\ components}{number\ of\ \ incident\ photons} \times 100 \quad (1)$$

This term is an "apparent" efficiency since it depends on the incident photons and not the photons absorbed by the photocatalyst.

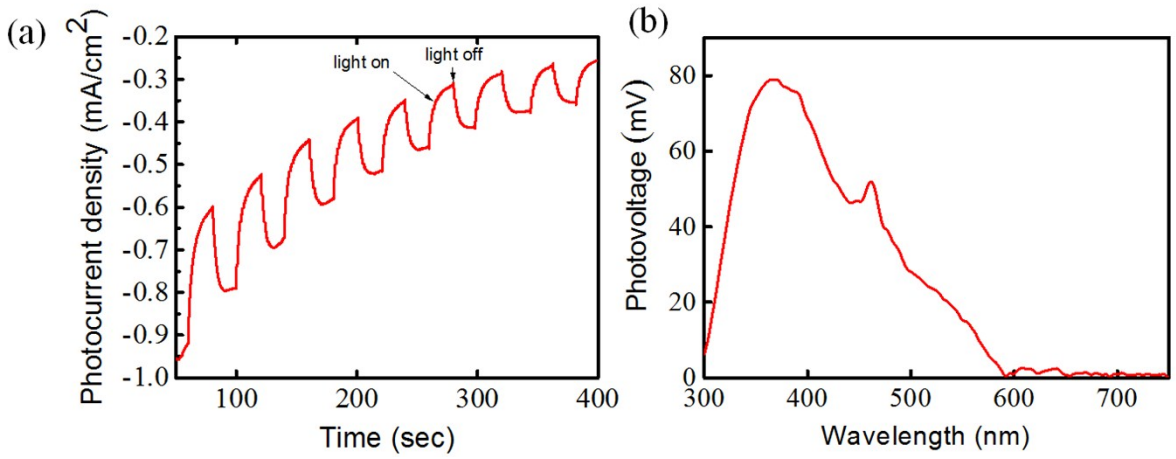

Figure S5. (a) Photocurrent density response with the light on/off over $Ag_{10}Si_4O_{13}$. (b) Surface photovoltage spectrum of $Ag_{10}Si_4O_{13}$, which shows its highest response in the visible-light range.

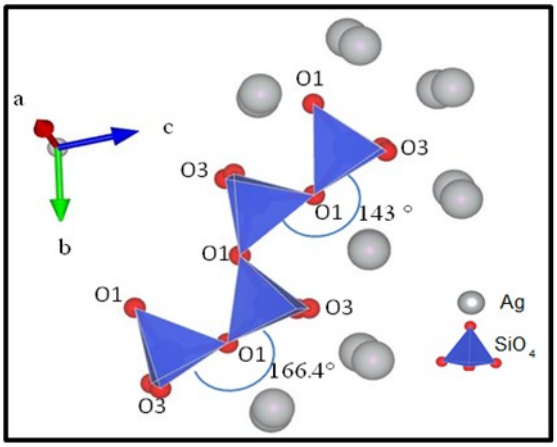

Figure S6. Three-dimensional chain composed of four SiO_4 tetrahedra. Note that the bonds twist with angles of 166.4° and 143º.

REFERENCES

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