Supplementary data for

Regulation of surface plasmon resonance and oxygen vacancy defects in chlorine doped Bi-BiO$_{2-x}$ for imidacloprid photo-degradation

Bin Yang $^{a}$, Zhiyuan Ma $^{b}$, Qian Li $^{a}$, Xinghuan Liu $^{a}$, Zhiqing Liu $^{a}$, Wenda Yang $^{a}$, Xuhong Guo $^{a}$, Xin Jia $^{a}$

$a$ School of Chemistry and Chemical Engineering/Key Laboratory for Green Processing of Chemical Engineering of Xinjiang Bingtuan, Key Laboratory of Materials-Oriented Chemical Engineering of Xinjiang Uygur Autonomous Region, Engineering Research Center of Materials-Oriented Chemical Engineering of Xinjiang Bingtuan, Shihezi University, Shihezi 832003, People’s Republic of China.

$b$ Département de Chimie, Université de Montréal, C.P. 6128, Succursale Centre-Ville, Montréal, Québec H3C 3J7, Canada.

To whom correspondence should be addressed. E-mail: jiaxin@shzu.edu.cn. (Xin Jia).
Scheme S1. The synthesis flow diagram of Cl-BiO$_{2-x}$ and BiOCl.

Fig. S1. (a) SEM images of Cl-BiO$_{2-x}$/120, (b) Cl-BiO$_{2-x}$/140, (c) Cl-Bi-BiO$_{2-x}$/160, (d) Cl-Bi-BiO$_{2-x}$/170, (e) Cl-Bi-BiO$_{2-x}$/180, (f) Cl-Bi-BiO$_{2-x}$/190.
**Fig. S2.** Elemental mappings of Cl-BiBiO$_{2-x}$/170.

**Fig. S3.** The high-resolution 4f Bi XPS spectra of Cl-BiBiO$_{2-x}$/140, Cl-BiBiO$_{2-x}$/170 and BiOCl.
Fig. S4. XPS results of Cl-BiO$_{2-x}$/170 Cl 2p and (e) inset EDX results.

Fig. S5. Transient photocurrent responses of Cl-BiO$_{2-x}$/140 and Cl-Bi-BiO$_{2-x}$/170 under simulate sunlight.

Fig. S6. (a) Imidacloprid removal in the repeated tests over the as-prepared Cl-BiO$_{2-x}$/170 and (b) the XRD of Cl-Bi-BiO$_{2-x}$/170 before and after photo-degradation.
Fig. S7. Photo-degradation of imidacloprid by Cl-Bi-BiO$_2$/170 and BiOCl(001) (a); photo-degradation kinetic curves of Cl-Bi-BiO$_2$/170 and BiOCl(001) (b).