Supporting Information

Photocatalytic properties of layered metal oxides substituted with silver by a molten $AgNO_3$ treatment

Hirotaka Horie,[a] Akihide Iwase,[a,b] Akihiko Kudo[a,b*]

[a] Department of Applied Chemistry, Faculty of Science, Tokyo University of Science, 1-3 Kagurazaka, Shinjuku-ku, Tokyo 162-8601, Japan

[b] Photocatalysis international Research Center, Research Institute for Science and Technology, Tokyo University of Science, 2641 Yamazaki, Noda-shi, Chiba 278-8510, Japan

Corresponding author: Akihiko Kudo (a-kudo@rs.kagu.tus.ac.jp)

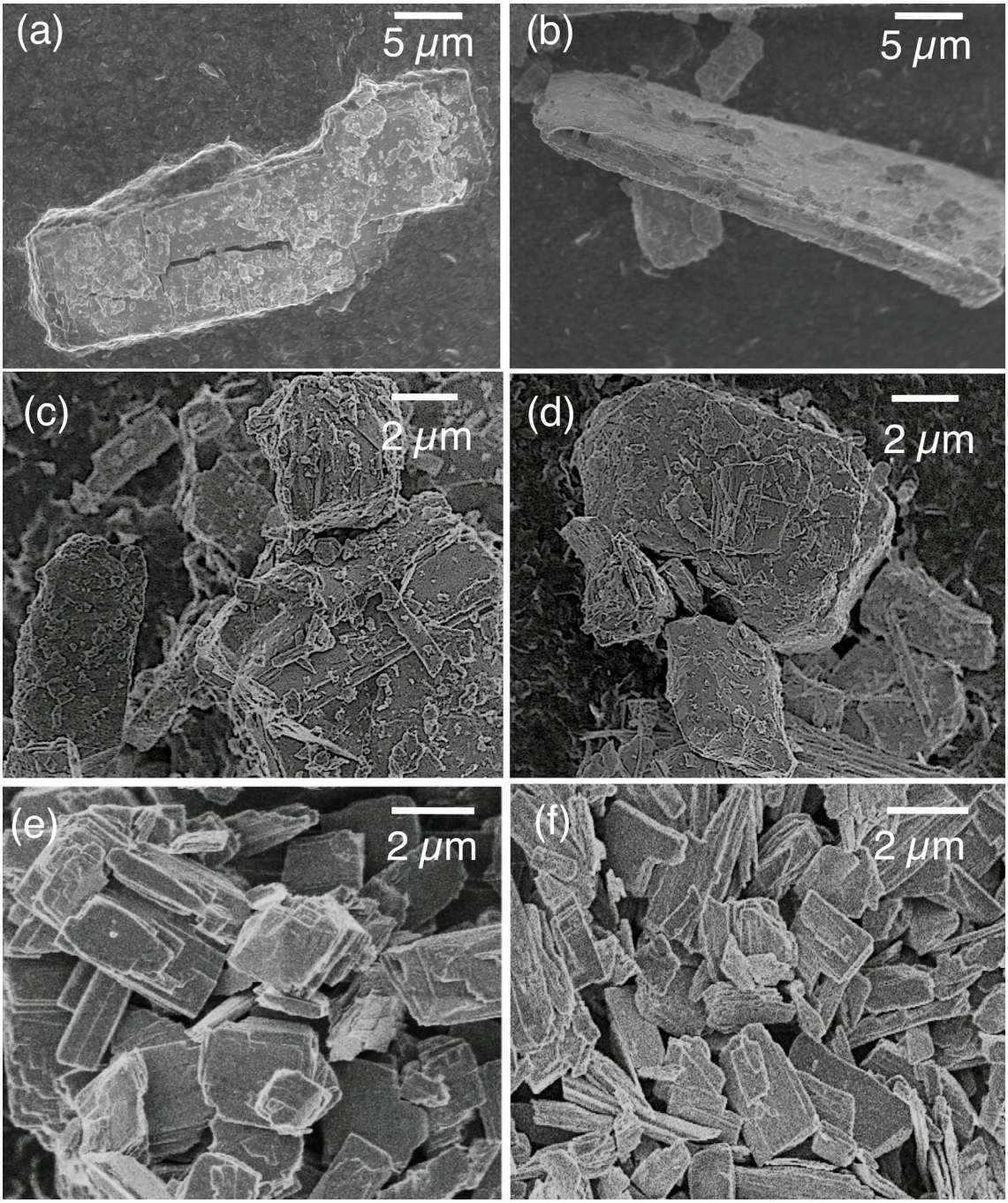

Figure S1 SEM images of (a) $K_4Nb_6O_{17}$, (b) Ag(I)-$K_4Nb_6O_{17}$, (c) $Na_2W_4O_{13}$, (d) Ag(I)-$Na_2W_4O_{13}$, (e) milled-$Na_2W_4O_{13}$, and (f) Ag(I)-milled-$Na_2W_4O_{13}$. Ag(I)-$K_4Nb_6O_{17}$ was obtained by a molten $AgNO_3$ treatment at 573 K for 3 h (Ag^+:K^+=1.2:1). Ag(I)-$Na_2W_4O_{13}$ and Ag(I)-milled-$Na_2W_4O_{13}$ were obtained by a molten $AgNO_3$ treatment at 523 K for 5 h (Ag^+:Na^+=2:1).

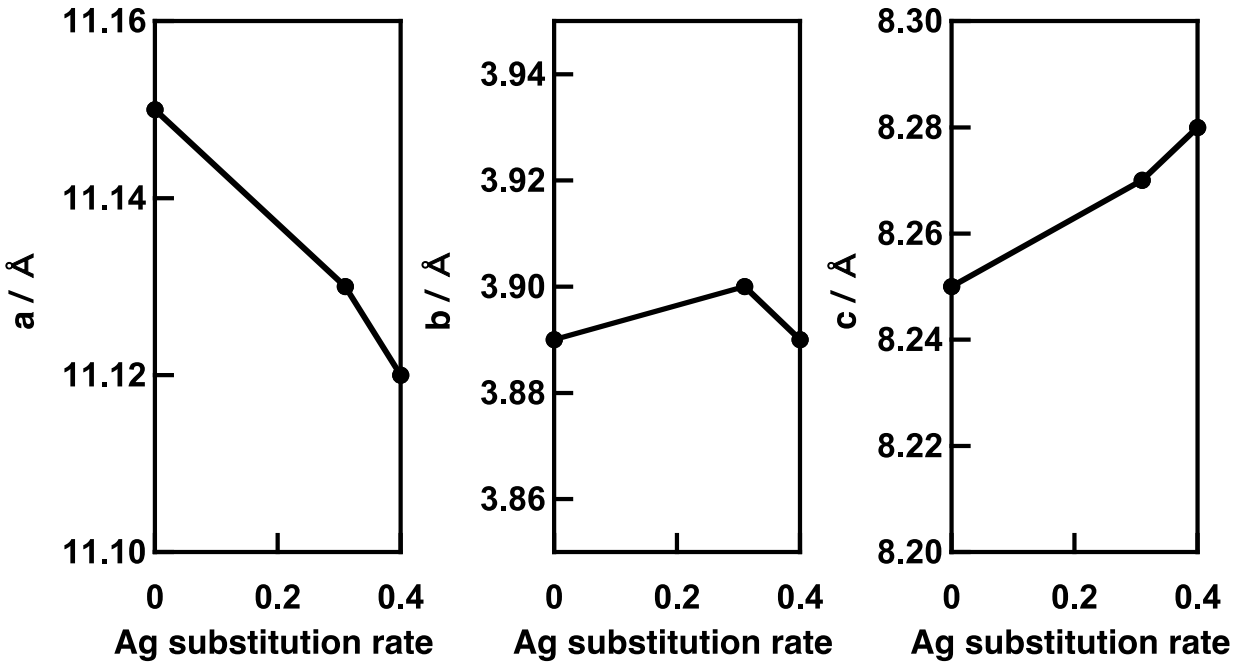

Figure S2 Lattice parameters a, b, and c of Ag(I)-substituted $Na_2W_4O_{13}$ estimated from XRD shown in Figure 1. Ag(I)-$Na_2W_4O_{13}$ was obtained by a molten $AgNO_3$ treatment at 523 K for 5 h (Ag^+:Na^+=2:1).

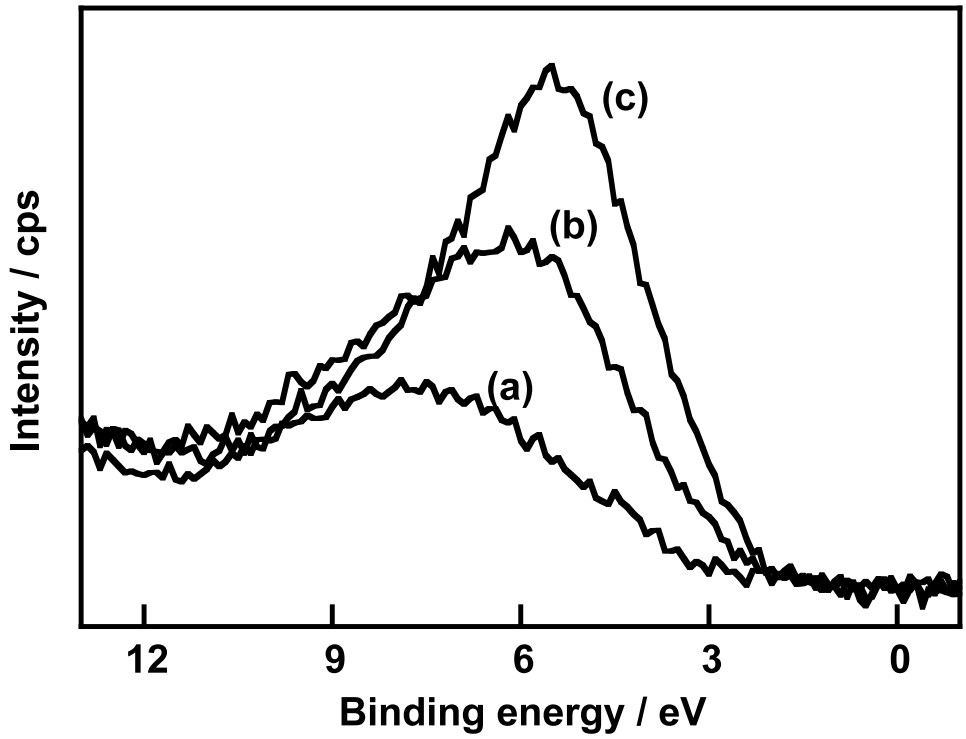

Figure S3 Valence band region of XPS for (a) $Na_2W_4O_{13}$, (b) Ag(I)-$Na_2W_4O_{13}$, and (c) Ag(I)-milled-$Na_2W_4O_{13}$. Ag(I)-$Na_2W_4O_{13}$ and Ag(I)-milled-$Na_2W_4O_{13}$ were obtained by a molten $AgNO_3$ treatment at 523 K for 5 h (Ag^+:Na^+=2:1).

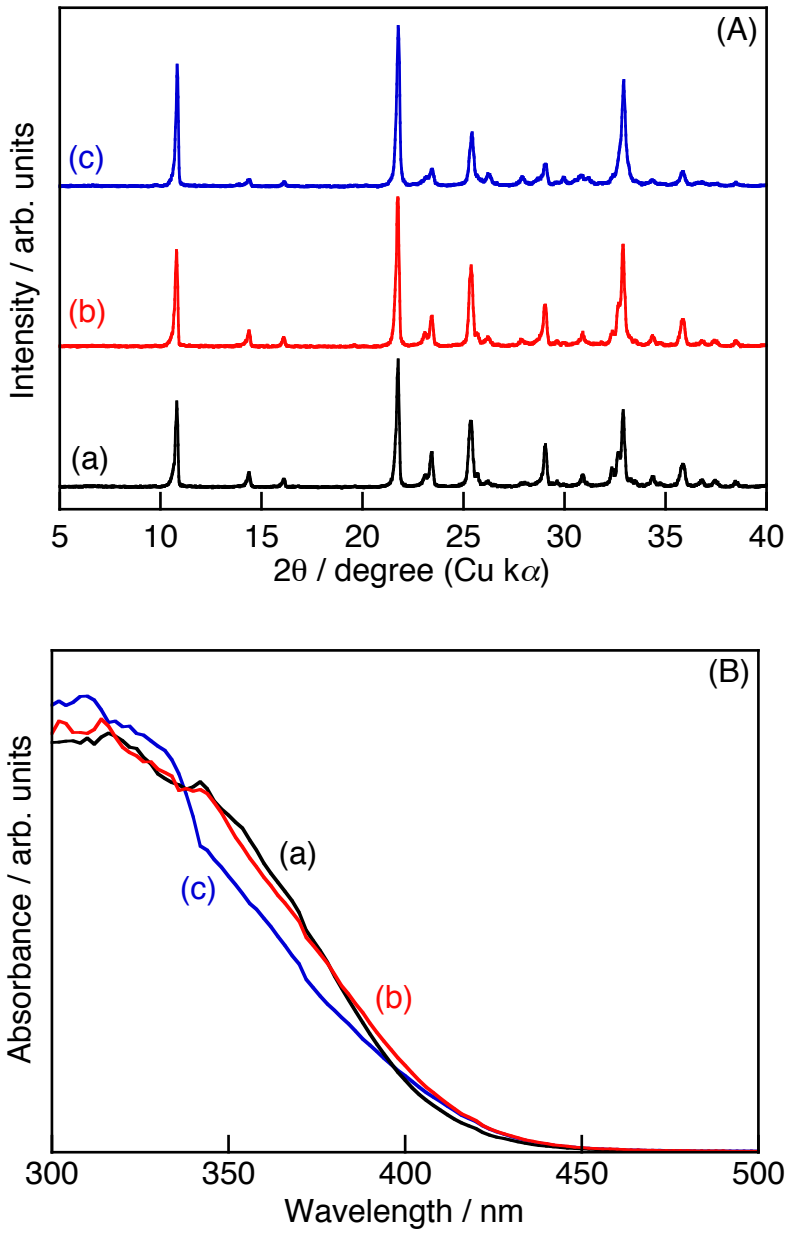

Figure S4 (A) XRD patterns and (B) diffuse reflectance spectra of Ag(I)-$Na_2W_4O_{13}$ obtained by a molten $AgNO_3$ treatment at (a) 523 K for 5 h (Ag^+:Na^+=2:1), (b) 523 K for 15 h (Ag^+:Na^+=2:1), and (c) 573K for 3h (Ag^+:Na^+=5:1).

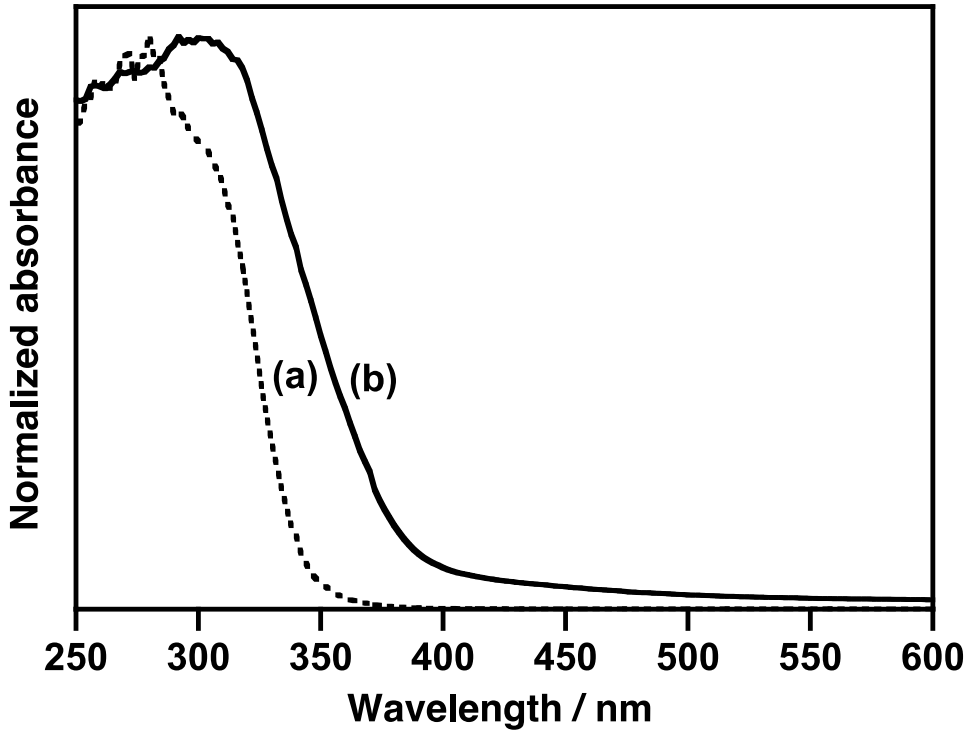

Figure S5 Diffuse reflectance spectra of (a) $K_4Nb_6O_{17}$ and (b) $AgNO_3$-treated-$K_4Nb_6O_{17}$ obtained by starring $K_4Nb_6O_{17}$ in 20 mmol L^{-1} of an aqueous $AgNO_3$ solution for 30 h at room temperature.

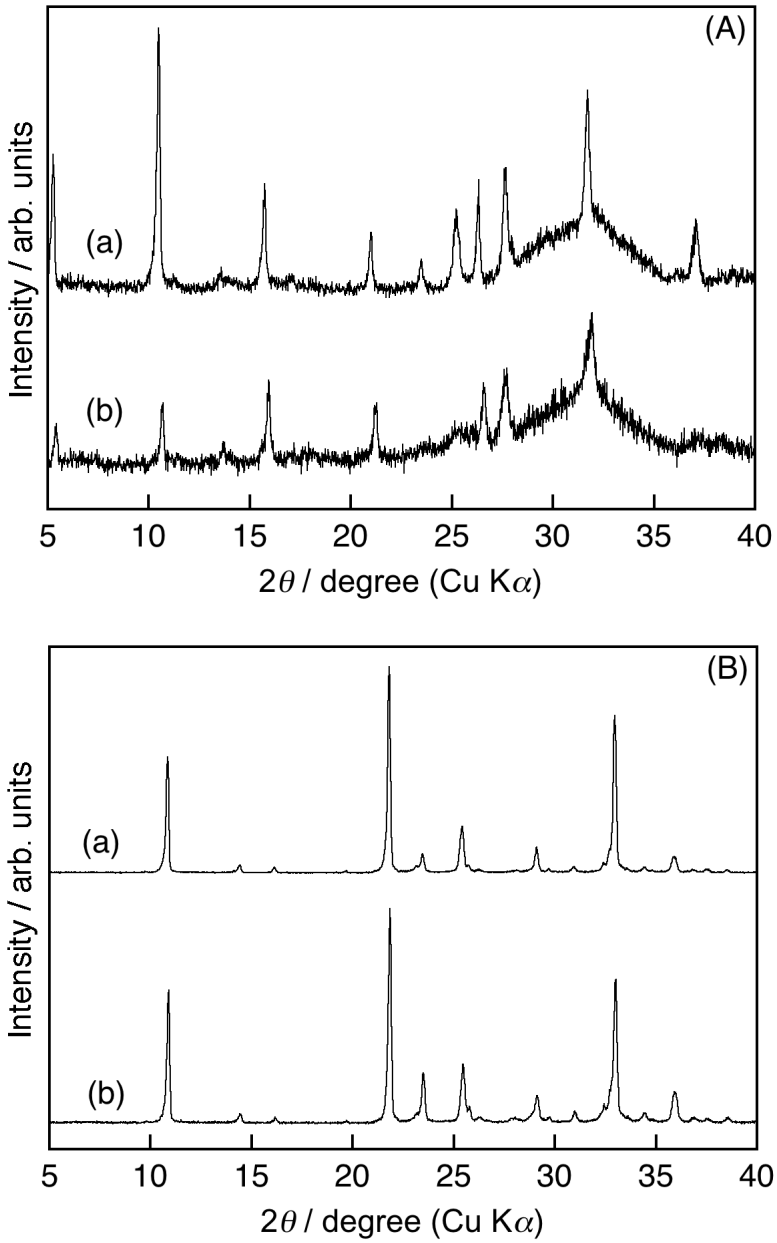

Figure S6 XRD patterns of (A) Ag(I)-$K_4Nb_6O_{17}$ and (B) Ag(I)-$Na_2W_4O_{13}$ (a) before and (b) after photocatalytic reaction. Ag(I)-$K_4Nb_6O_{17}$ was obtained by a molten $AgNO_3$ treatment at 573 K for 3 h (Ag^+:K^+=1.2:1). Ag(I)-$Na_2W_4O_{13}$ was obtained by a molten $AgNO_3$ treatment at 523 K for 5 h (Ag^+:Na^+=2:1).