Electronic Supplementary Information

Influences of pulverization and annealing treatment on photocatalytic activity of $BiVO_4$ for oxygen evolution

Kazuya Okuno,[a,b] Hiromu Kumagai,[a] Junie Jhon M. Vequizo,[c‡] Kosaku Kato,[c] Makoto Kobayashi,[d] Akira Yamakata,*[c] Masato Kakihana [a] and Hideki Kato*[a]

[a] *Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai 980-8577, Japan*

[b] *Department of Chemical Engineering, Tohoku University, Sendai 980-8579, Japan*

[c] *Graduate School of Engineering, Toyota Technological Institute, Nagoya 468-8511, Japan*

[d] *Institute of Materials and Systems for Sustainability, Nagoya University, Nagoya 464-8601, Japan*

Present address

‡ *Research Initiative for Supra-Materials, Shinshu University, Nagano 380-8553, Japan.*

Corresponding E-mail:
yamakata@toyota-ti.ac.jp (A. Y.)
hideki.kato.e2@tohoku.ac.jp (H. K.)

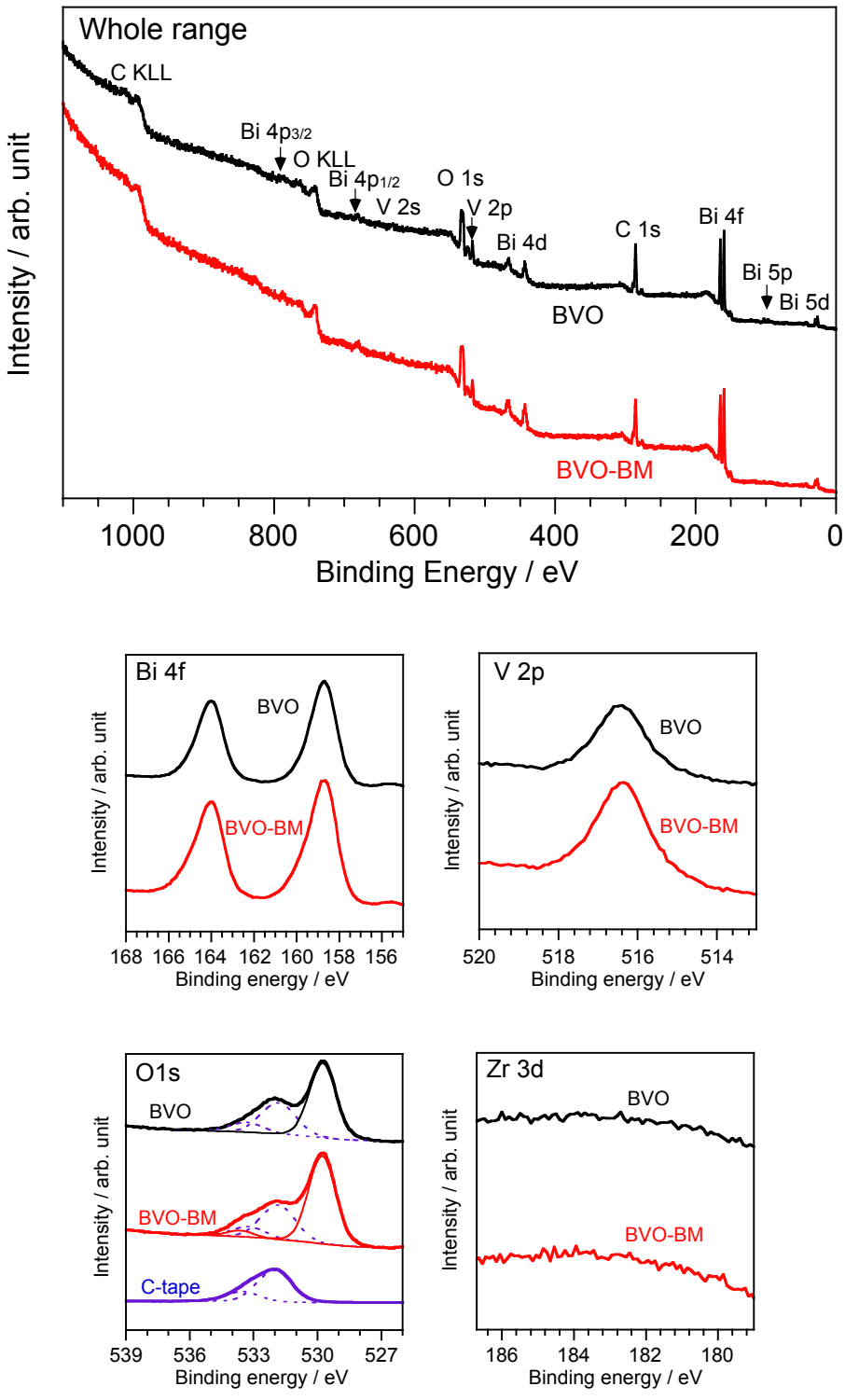

Fig. S1 XPS spectra of $BiVO_4$ before and after the ball milling treatment.

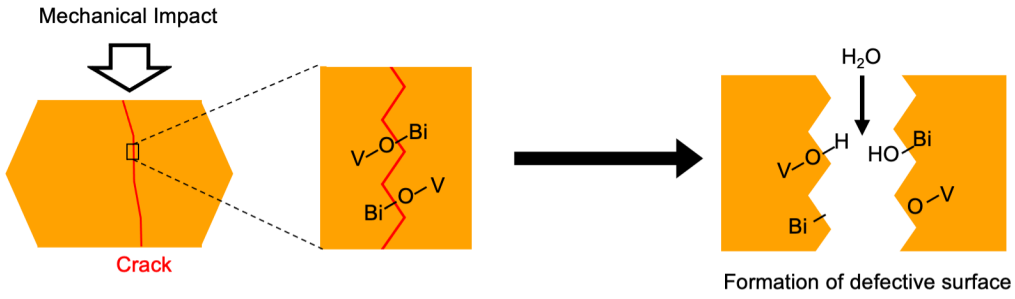

Fig. S2 Formation of defective surface by the pulverization.

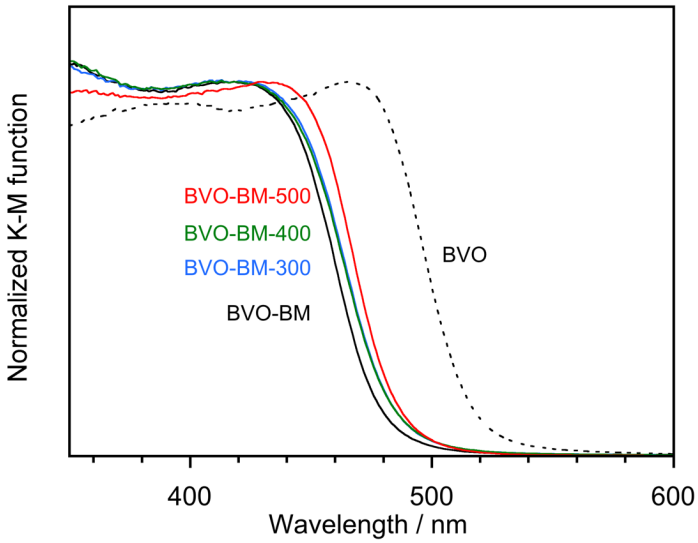

Fig. S3 UV-vis spectra of BVO, BVO-BM and BVO-*X*.

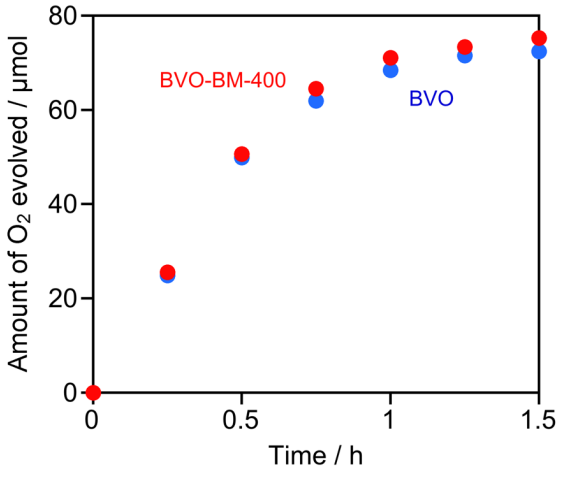

Fig. S4 O_2 evolution using Fe^{3+} as an electron acceptor over BVO and BVO-BM-400 under white light (λ > 420nm). Conditions: $BiVO_4$, 100 mg, reactant solution, 160 mL, 2 mM of an aqueous $Fe(ClO_4)_3$ solution at pH2.3; irradiation, 300 W Xe lamp (λ > 420 nm).

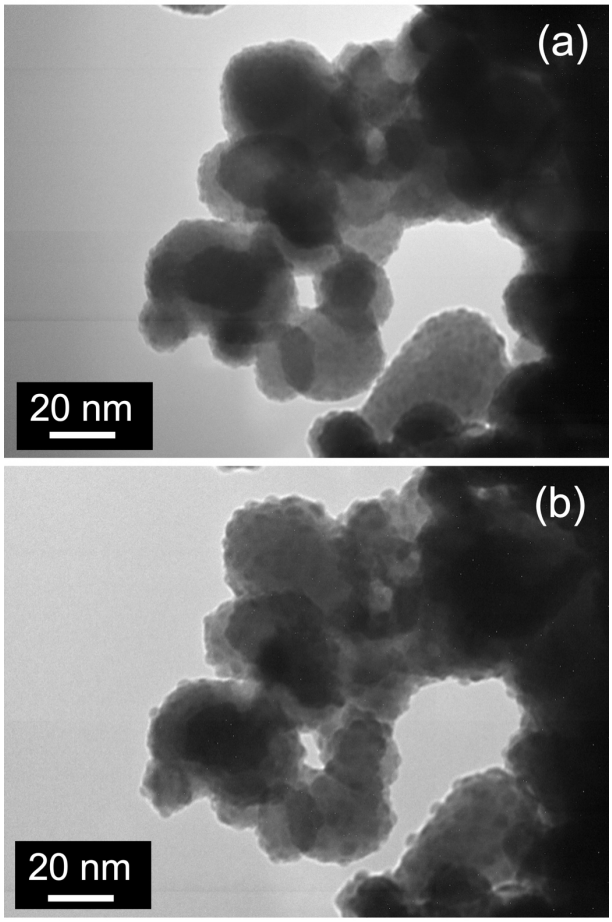

Fig. S5 TEM images of BVO-BM taken (a) immediately after the electron beam exposure and (b) after 30 seconds of (a). Acceleration voltage was 80 kV.

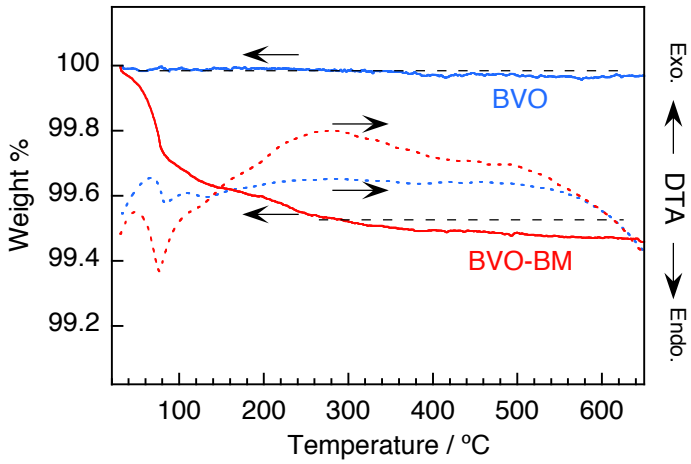

Fig. S6 TG-DTA curves of BVO and BVO-BM analyzed in air.

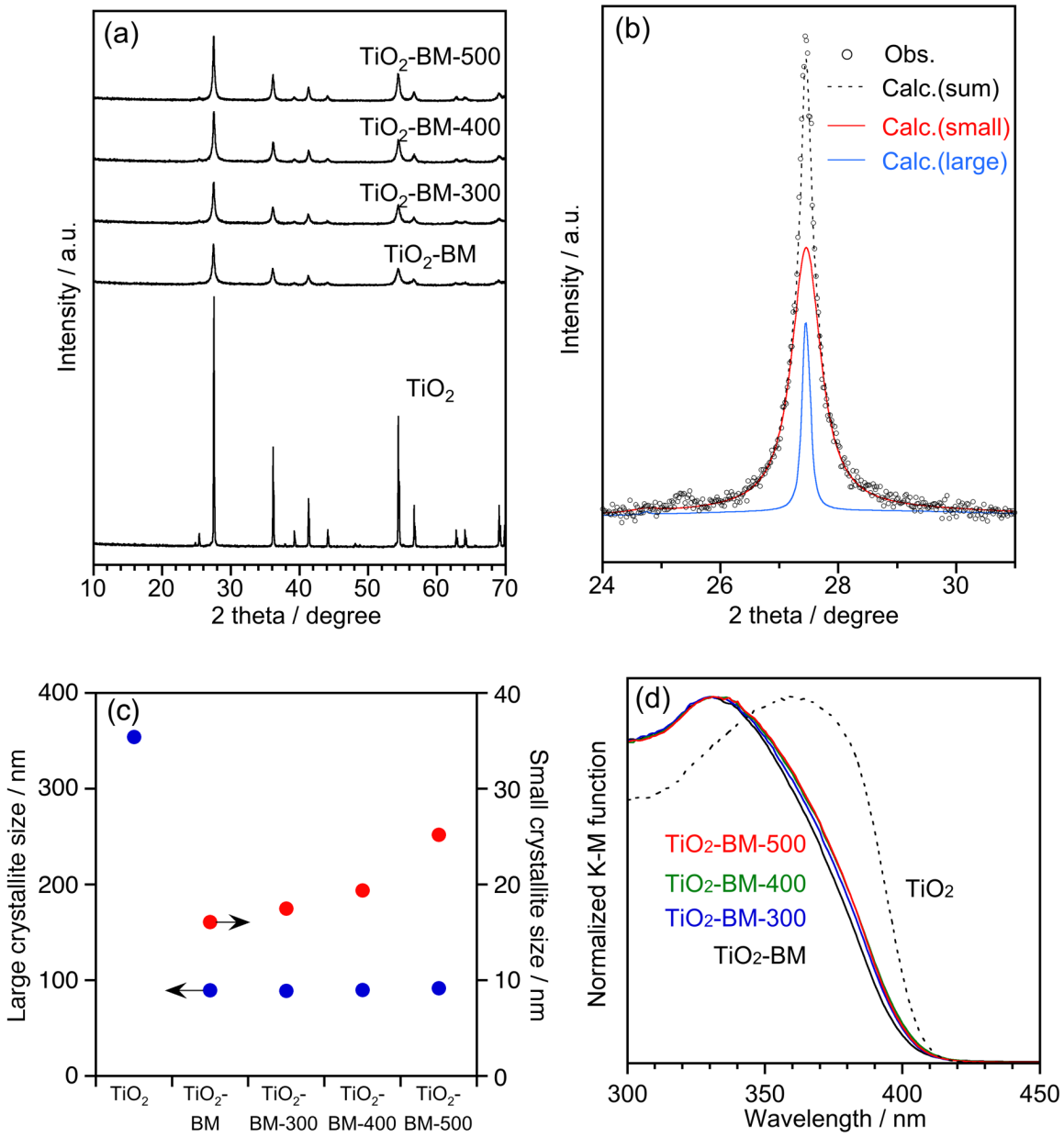

Fig. S7 (a) XRD patterns of TiO_2, TiO_2-BM and TiO_2-BM-*X*, (b) representative Rietveld fitting result for TiO_2-BM, (c) crystallite sizes and (d) UV-vis spectra of TiO_2, TiO_2-BM and TiO_2-BM-*X*.

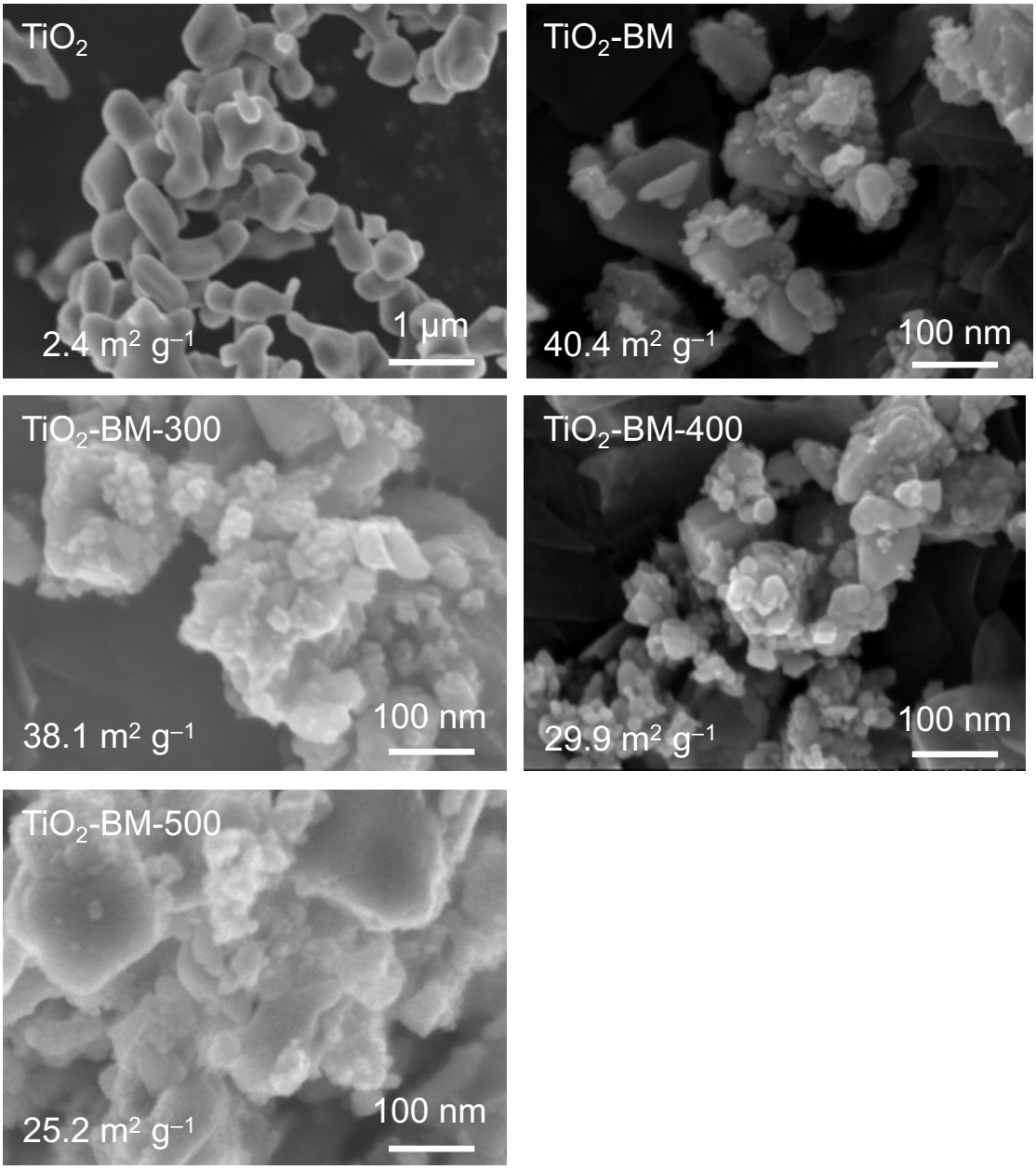

Fig. S8 SEM images and S_{BET} of TiO_2, TiO_2-BM and TiO_2-BM-*X*.

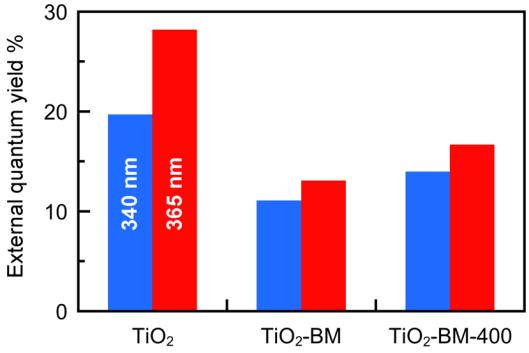

Fig. S9 Comparison of EQY of TiO_2, TiO_2-BM and TiO_2-BM-400 measured at 340 and 365 nm. Conditions: sample, 100 mg; reactant solution, 2 mM of an aqueous $Fe(ClO_4)_3$ solution at pH2.3; irradiation, 6.6 mW at 340 nm and 11.3 mW at 365 nm.