Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting information

Intercalative and non-intercalative photo-recharge using all-solid-state cells for solar energy conversion and storage

Masataka Yoshimoto,[1] Kazuhisa Tamura,[2] Kenta Watanabe,[1]* Keisuke Shimizu,[3] Yuhei Horisawa,[a] Takeshi Kobayashi,[d] Hanae Tsurita,[d] Kota Suzuki, [3] Ryoji Kanno, [3] Masaaki Hirayama[1,3]*

a. Department of Chemical Science and Engineering, School of Materials and Chemical Technology, Tokyo Institute of Technology, 4259 Nagatsuta-cho, Midori-ku, Yokohama 226-8501, Japan
b. Materials Sciences Research Center, Japan Atomic Energy Agency, 1-1-1, Koto, Sayo, Hyogo 679-5148, Japan
c. Research Center for All-Solid-State Battery, Institute of Innovative Research, Tokyo Institute of Technology, 4259 Nagatsuta-cho, Midori-ku, Yokohama 226-8501, Japan
d. Department of Electronic Chemistry, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, 4259 Nagatsuta-cho, Midori-ku, Yokohama 226-8501, Japan.

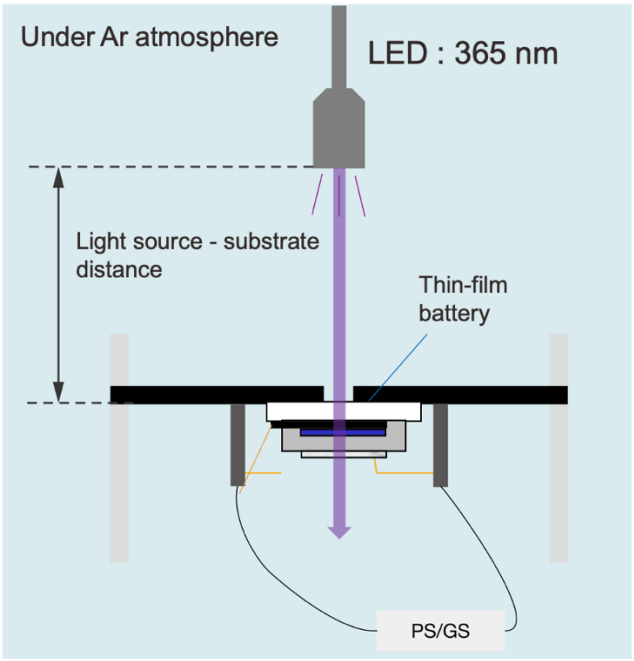

Fig. S1 Scheme of the measurement system for photoelectrochemical measurements.

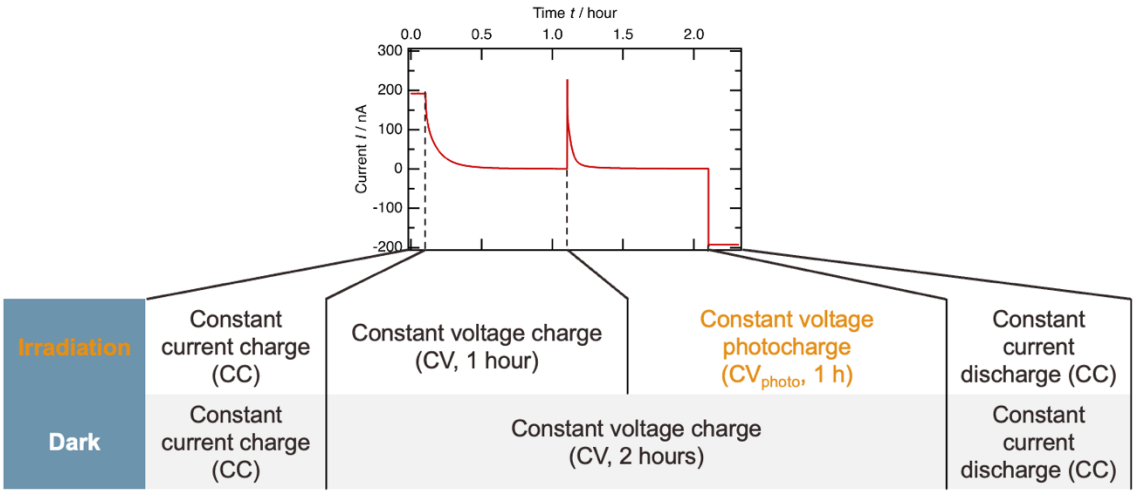

Figure S2 Time variation of current in the constant current-constant voltage-constant voltage under light irradiation(CC-CV-CV_{photo}) /constant current(CC) discharge. The top row of the table shows the CC-CV-CV_{photo} charge/CC discharge method. The bottom row of the table shows the CC-CV charge/CC discharge method.

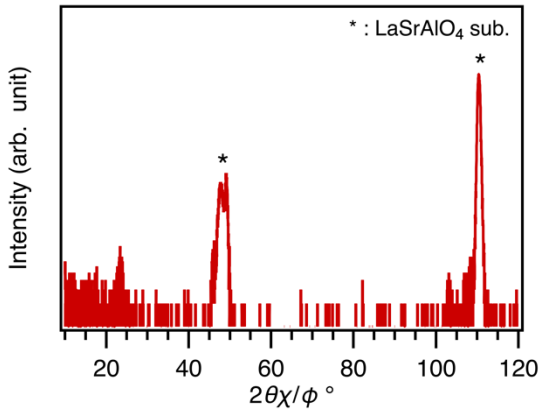

Fig. S3 A X-ray diffraction pattern at in-plane direction of an a-TiO_2:Nb(001)/$CaRuO_3$(100) films synthesized on $LaSrAlO_4$(001) substrate.

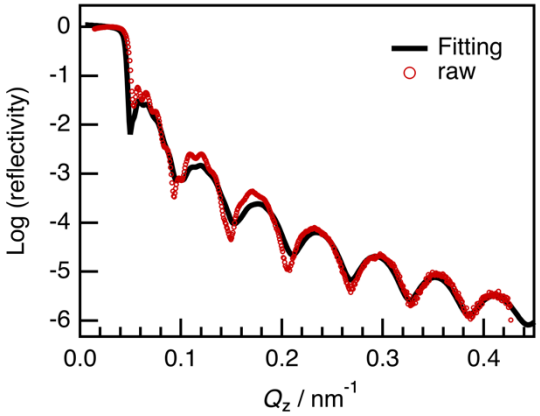

Fig. S4 A X-ray reflection spectra of an a-TiO_2:Nb(001)/$CaRuO_3$(100) films synthesised on $LaSrAlO_4$(001) substrate.

Table S1 Refined thickness and roughness of a-TiO_2:Nb and $CaRuO_3$ films.

Layer	Thickness l/nm	X-ray SLD ρ/10^{-4} nm^{-2}	Roughness r/nm
a-TiO_2:Nb	10.7	29.845	0.3
$CaRuO_3$	40.0	41.194	0.1
$LaSrAlO_4$ (substrate)	-	43.938	0.8

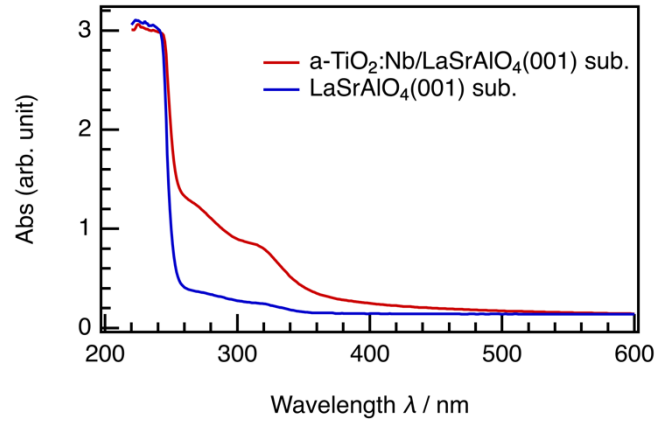

Fig. S5 Absorption spectrums of a-TiO_2:Nb(001)/$LaSrAlO_4$(001) substrate and $LaSrAlO_4$(001) substrate.

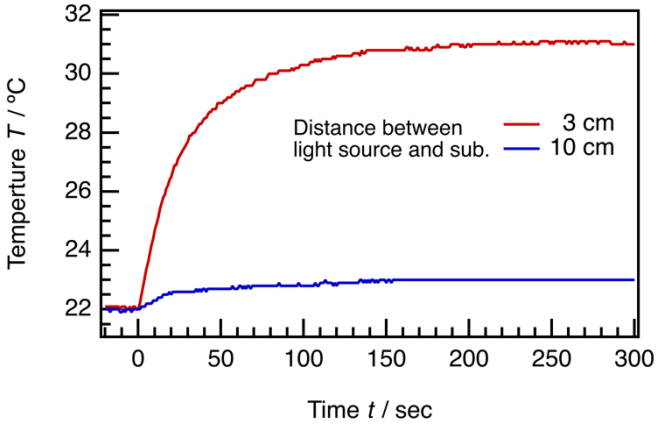

Fig. S6 Temperature change by light irradiation at different distances.