Electronic Supplementary Information

Integrating redox flow battery into Z-Scheme water splitting system for enhancing solar energy conversion efficiency

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Fig. S1 Theoretical maximal solar energy conversion efficiency as a function of band edge absorption wavelength in one-step water splitting system a) and as a function of band edge absorption wavelengths of two semiconductors in Z-scheme water splitting system b). Solar irradiance used for the calculation is taken from AM 1.5G data.
Fig. S2 Schematic of the RFB-integrated Z-scheme water splitting system in an ideal case with the energy efficiency reaching 100%.
Fig. S3 Theoretical maximal solar energy conversion efficiency as a function of the band edge absorption wavelengths of two semiconductors in the RFB-integrated Z-scheme water splitting system. Solar irradiance used for the calculation is taken from AM 1.5G data.
Fig. S4  a) UV-Vis absorption of the 10-times-diluted DMBQ/DMBQH$_2$ solution during the OER-charge process; the increasing absorption centered at 285 nm and the decreasing absorption at 330 nm indicate the conversion from DMBQ to DMBQH$_2$. b) UV-Vis absorption of the 20-times-diluted Fe(CN)$_6^{4-}$/Fe(CN)$_6^{3-}$ solution during the HER-charge process; the increasing absorption centered at 420 nm indicates the conversion from Fe(CN)$_6^{4-}$ to Fe(CN)$_6^{3-}$.
Fig. S5 Schematic of the energy loss and electricity production in the quinone/ferricyanide RFB integrated PSII-ZrO$_2$/TaON Z-scheme water splitting system.
**Fig. S6** Cyclic voltammogram curves of 1 mM BQDSH$_2$, [SiW$_{11}$O$_{39}$Mn$^{II}$(H$_2$O)]$^{6-}$, Cr$^{III}$-EDTA in 100 mM PBS solution scanned at 50 mV s$^{-1}$. Cyclic voltammetry tests were performed in a three-electrode system with a graphite plate as the working electrode, a Pt plate as the counter electrode and a saturated calomel electrode as the reference electrode.
Fig. S7 Time courses of hydrogen evolution by PtCrOₓ-ZrO₂/TaON with 2.5 mM [SiW₁₁O₃₉Mn²⁺(H₂O)]⁶⁻ and 10 mM BQDSH₂ as electron donors in 20 mL PBS buffer solution. Xenon lamp equipped with a 420 nm long-pass filter was used as light source. Temperature was 25 °C.