

(Supporting Information)

Synergistic doping effects of ZnO:N/BiVO₄:Mo bunched nanorod array photoanode for enhancing charge transfer and carrier density in photoelectrochemical systems

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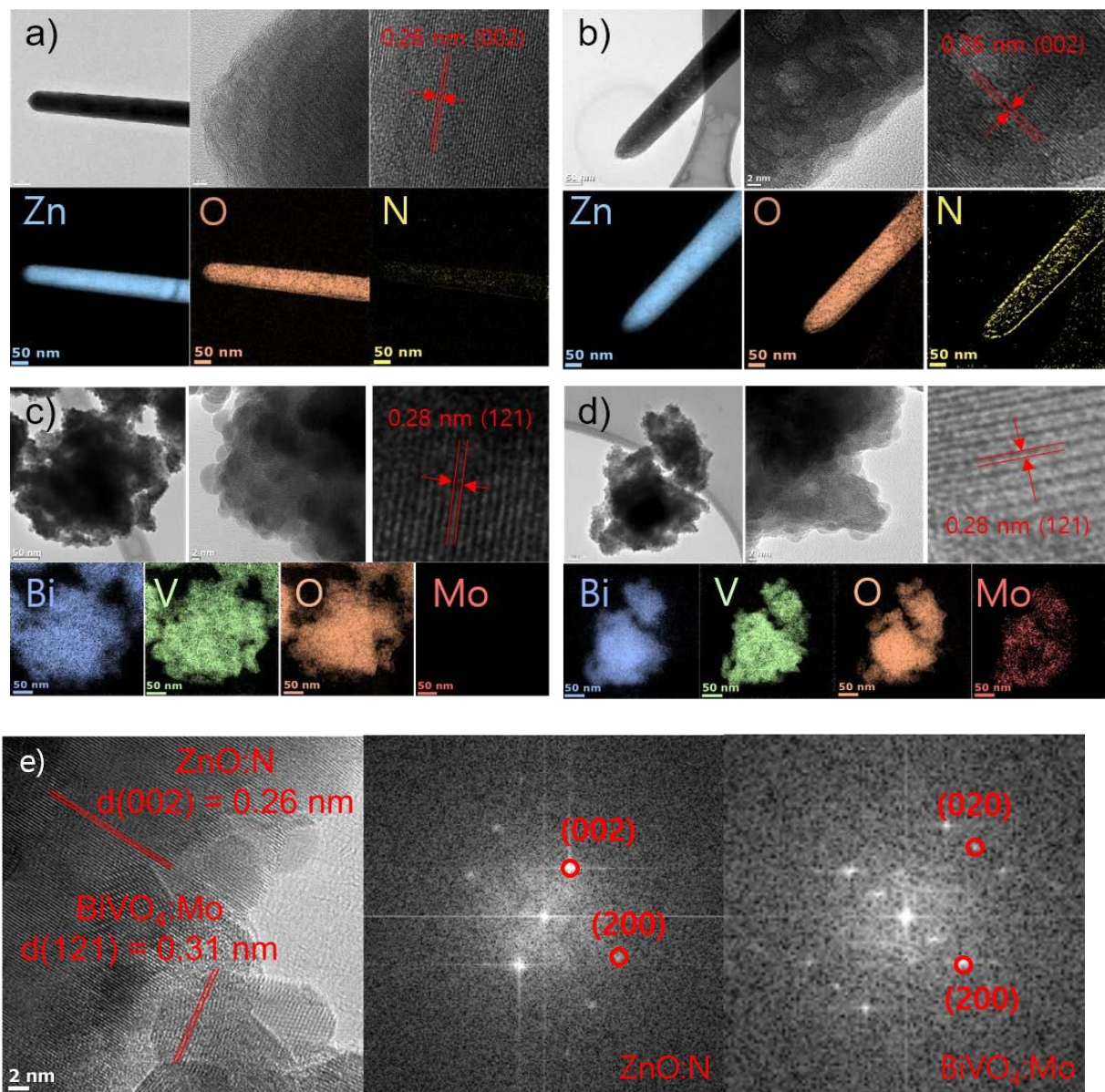


Fig. S1. TEM, HRTEM and EELS elemental mapping images of a) ZnO, b) ZnO:N, c) BiVO₄, and d) BiVO₄:Mo, e) FFT pattern of ZnO:N and BiVO₄:Mo.

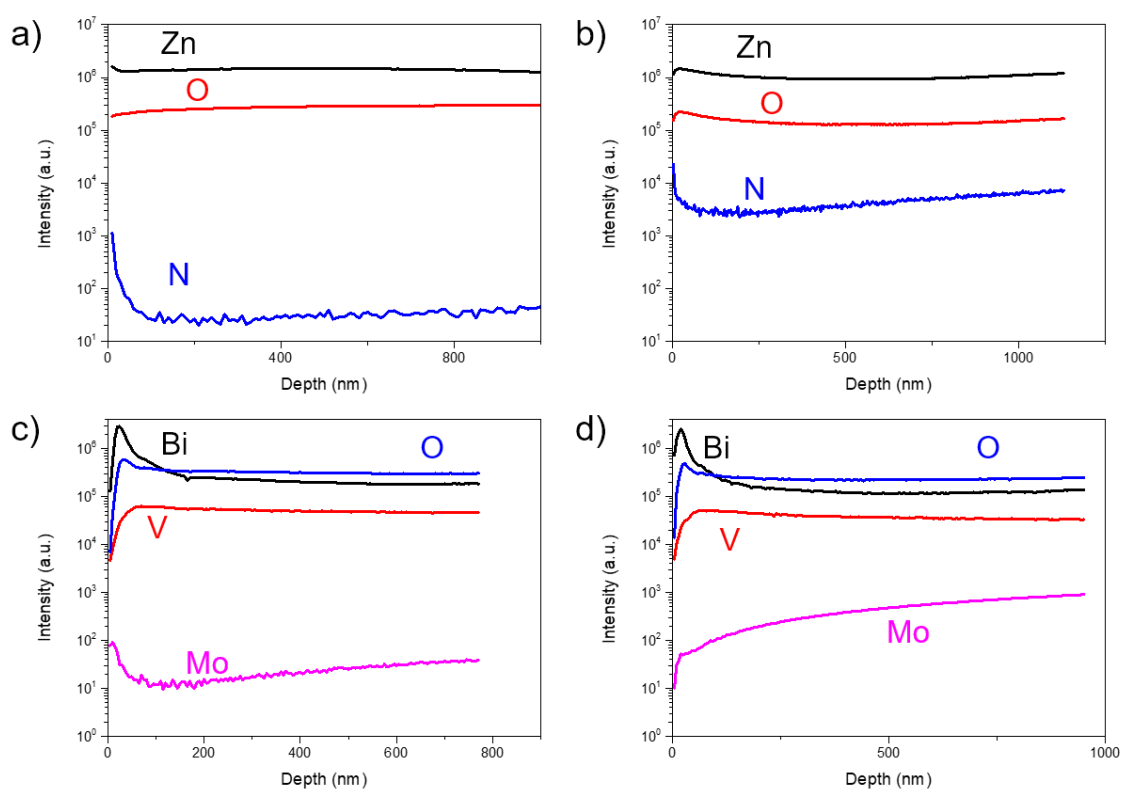


Fig. S2. Secondary ion mass spectroscopy (SIMS) depth profiling of a) ZnO, b) ZnO:N, c) BiVO₄, and d) BiVO₄:Mo.

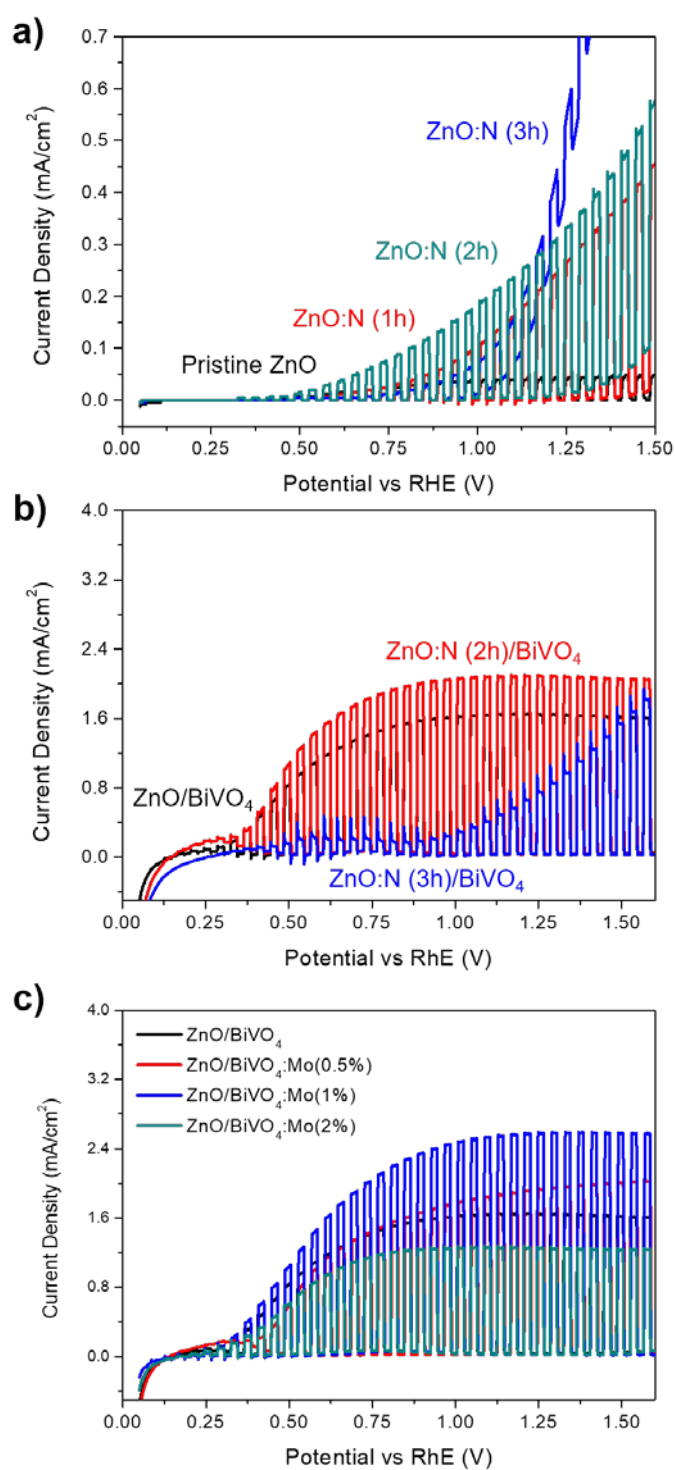


Fig. S3. Linear-sweep voltammetry curves of a) ZnO and ZnO:N NRs prepared with various reductive annealing times, b) ZnO/BiVO₄ and ZnO:N/BiVO₄ prepared with various reductive annealing times, c) ZnO/BiVO₄ and ZnO/BiVO₄:Mo prepared with various Mo precursor ratio to V precursor.

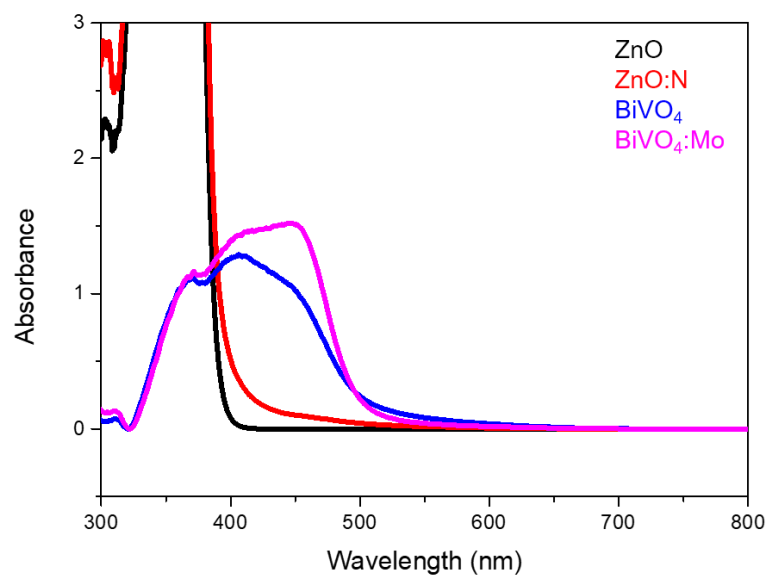


Fig. S4. UV-vis absorption spectra of ZnO, ZnO:N, BiVO₄ and BiVO₄:Mo samples.

Table. S1. Parameters of PL decay kinetics for ZnO, ZnO:N, ZnO/BiVO₄, ZnO:N/BiVO₄, ZnO/BiVO₄:Mo, and ZnO:N/BiVO₄:Mo samples through fitting with three-exponential decay.

	A ₁	τ_1 (ns)	A ₂	τ_2	A ₃	τ_3	$\langle\tau\rangle$	k _{et} (s ⁻¹)
ZnO	0.00912	805.46	0.06779	60.94	3.85199	4.38	220.201	-
ZnO:N	0.02917	339.53	0.19994	26.4	9.16527	2.48	93.86	-
ZnO/BiVO ₄	0.04799	3.66809	0.21429	0.26315	1.15284	0.01302	2.670368	0.37426
ZnO:N/BiVO ₄	0.04432	3.14099	0.21528	0.18465	1.7075	0.00808	2.307077	0.433355
ZnO:BiVO ₄ :Mo	0.0364	2.79783	0.20054	0.16553	1.64765	0.00919	1.934819	0.516624
ZnO:N/BiVO ₄ :Mo	0.03654	2.80023	0.18839	0.18152	1.55822	0.00974	1.930701	0.517853

Table. S2. Fitting parameters for EIS data of ZnO, ZnO:N, ZnO/BiVO₄, ZnO:N/BiVO₄, ZnO/BiVO₄:Mo, and ZnO:N/BiVO₄:Mo samples.

	$R_s (\Omega)$	$R_{ct} (\Omega)$	$C_{ct} (10^{-12} \text{ F})$
ZnO/BiVO ₄	6.8	4987	69.47
ZnO:N/BiVO ₄	11.88	4478	65.95
ZnO:BiVO ₄ :Mo	4.46	3584	74.1
ZnO:N/BiVO ₄ :Mo	41.4	2601	85.13