

Supporting Information

Mg-doped Ta₃N₅ nanorod coated with a conformal CoOOH layer for water oxidation : bulk and surface dual modification of photoanodes

Lang Pei^a, Zhe Xu^a, Zhan Shi^b, Heng Zhu^a, Shicheng Yan^{a,*}, Zhigang Zou^{a,b}

^aEco-materials and Renewable Energy Research Center (ERERC), Collaborative Innovation Center of Advanced Microstructures, College of Engineering and Applied Sciences, Nanjing University, No. 22 Hankou Road, Nanjing, Jiangsu 210093, P. R. China

^bJiangsu Key Laboratory for Nano Technology, National Laboratory of Solid State Microstructures, Department of Physics, Nanjing University, No. 22 Hankou Road, Nanjing, Jiangsu 210093, P. R. China.

Corresponding Author

*E-mail: Shicheng Yan: yscfei@nju.edu.cn (S. Yan)

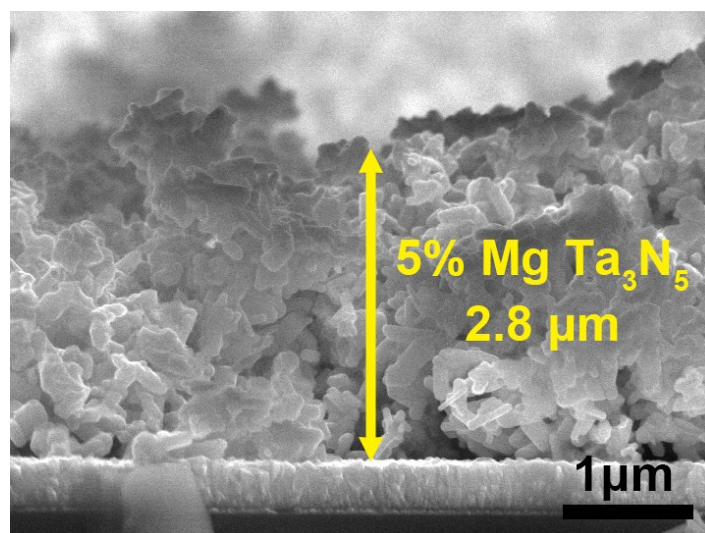


Fig. S1 Cross-sectional SEM image for 5% Mg-Ta₃N₅ nanorods photoanode.

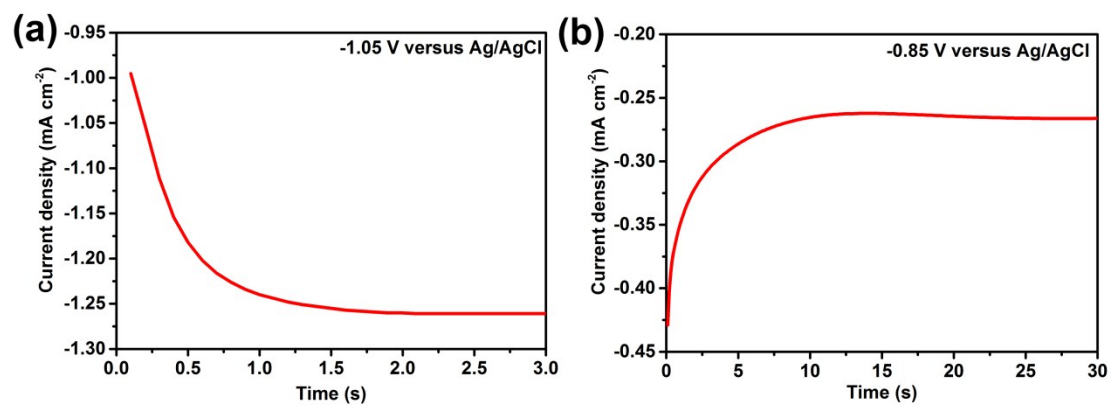


Fig. S2 Current-time curves, registered during the two-step potentiostatic electrodeposition of Co(OH)₂ on as-prepared electrodes. (a) Nucleation step and (b) slower growth step. The electrodeposition was performed in a 0.01M cobalt (II) nitrate hexahydrate solution, at pH 5.5 and T =273K.

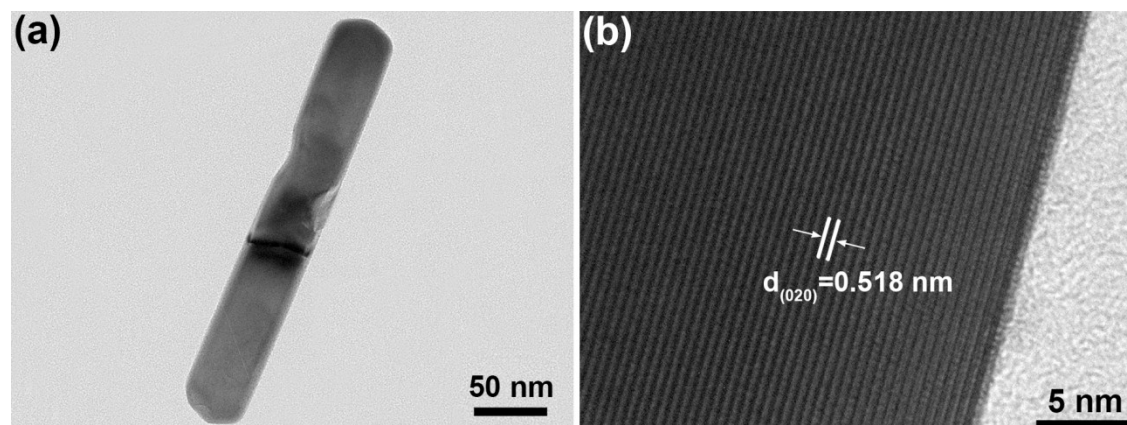


Fig. S3 (a) TEM and (b) HRTEM images for pure Ta₃N₅ nanorod.

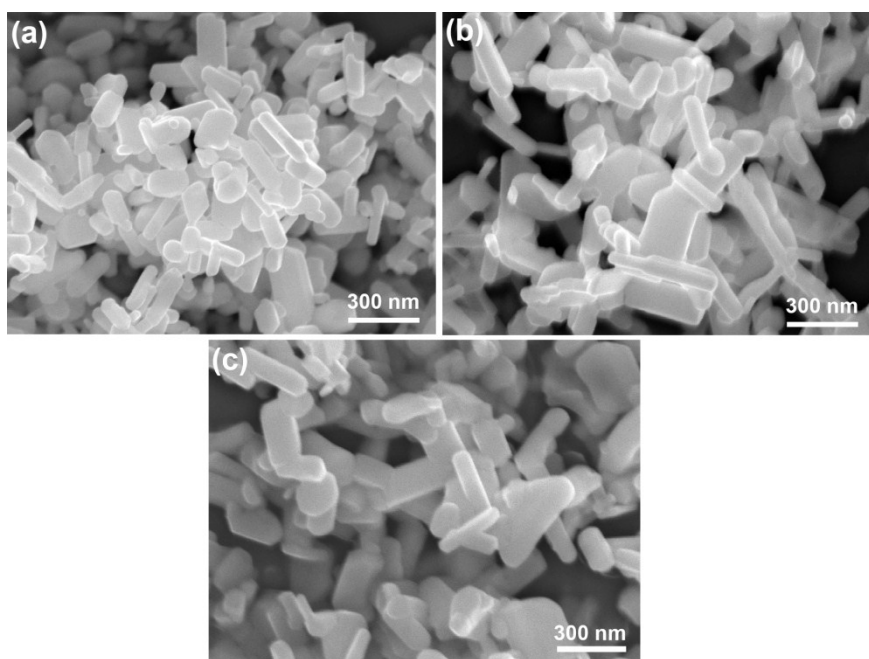


Fig. S4 SEM images for (a) pure Ta₃N₅, (b) 3% Mg-Ta₃N₅ and (c) 10% Mg-Ta₃N₅ nanorods.

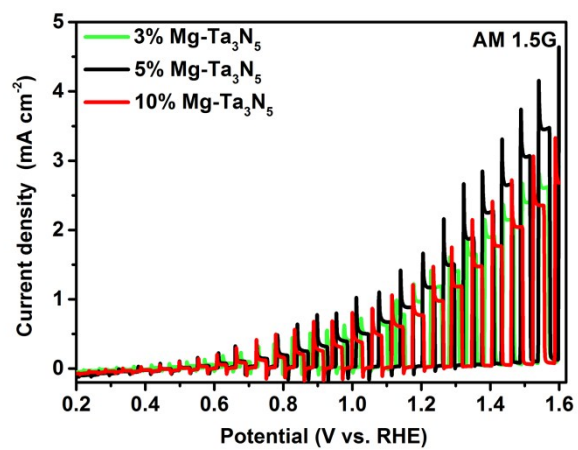


Fig. S5 Current-potential curves for 3% Mg-Ta₃N₅, 5% Mg-Ta₃N₅ and 10% Mg-Ta₃N₅ photoanodes under AM 1.5G simulated sunlight (100 mW cm⁻²) in 1 M NaOH aqueous solution (pH 13.6).

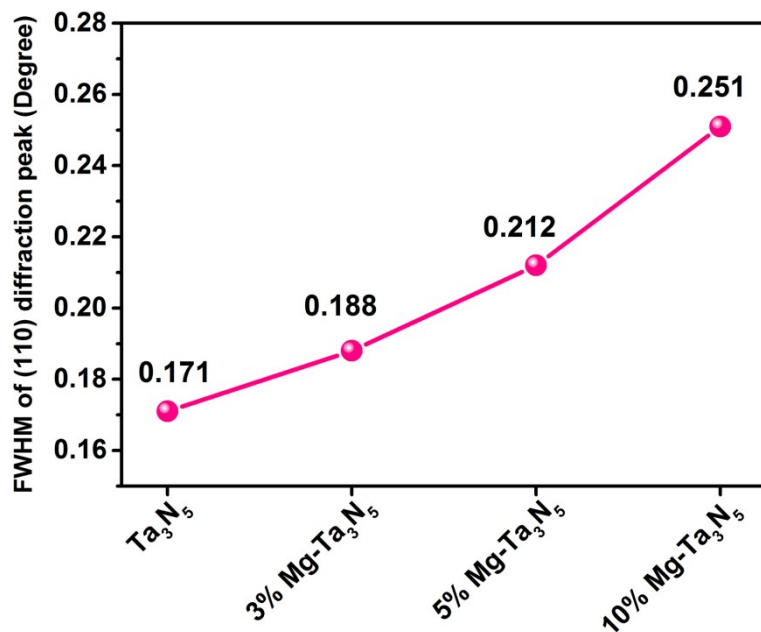


Fig. S6 The FWHM of the (110) diffraction peak for Ta₃N₅ and Mg-Ta₃N₅.

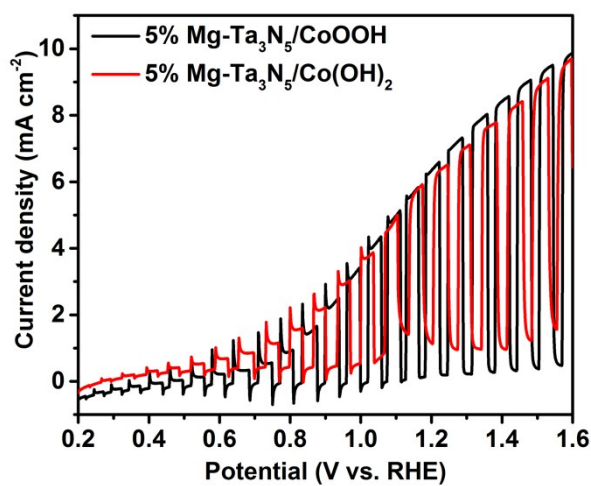


Fig. S7 Current-potential curves of 5% Mg-Ta₃N₅/CoOOH (10s) and 5% Mg-Ta₃N₅/Co(OH)₂ (10s) photoanodes in 1 M NaOH aqueous solution (pH 13.6) under AM 1.5G simulated sunlight (100 mW cm⁻²) illumination.

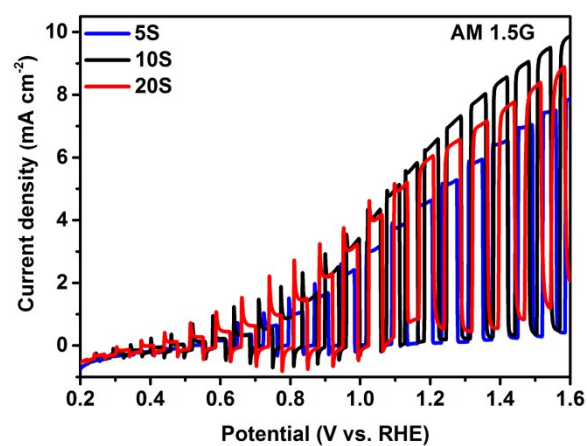


Fig. S8 Current-potential curves for 5% Mg-Ta₃N₅ photoanodes coated with CoOOH for 5, 10 and 20s under AM 1.5G simulated sunlight (100 mW cm⁻²) in 1 M NaOH aqueous solution (pH 13.6).

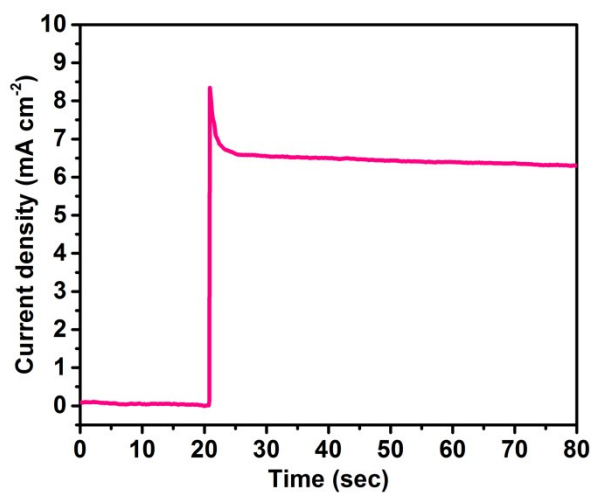


Fig. S9 The steady-state photocurrent of 5% Mg-Ta₃N₅/CoOOH (10s) photoanode in 1 M NaOH aqueous solution (pH 13.6) under AM 1.5G simulated sunlight (100 mW cm⁻²) illumination at 1.23 V_{RHE}.

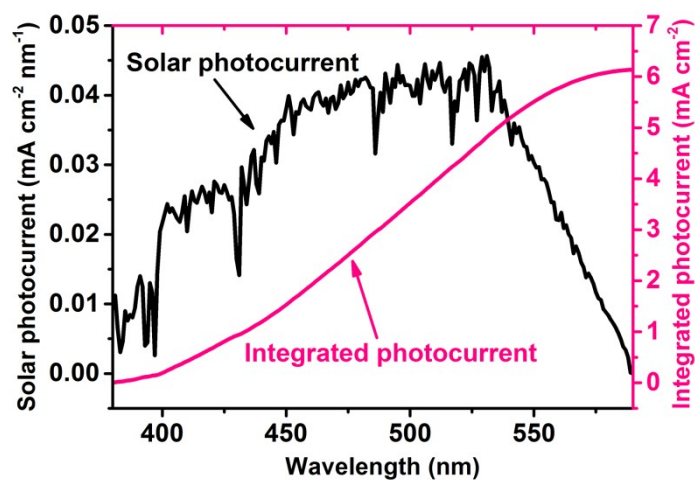


Fig. S10 Solar photocurrent spectrum (black) of the 5% Mg-Ta₃N₅/CoOOH (10s) photoanode at 1.23 V_{RHE} obtained by multiplication of its IPCE spectrum with the photon flux spectrum of global sunlight (100 mW/cm² AM 1.5G). Integrated photocurrent under global sunlight between 380 nm and 590 nm (pink).