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Tantalum Oxynitride (TaON): Synthesis Routes, Structural Diversity, and Solar Water Splitting Activity

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This work is dedicated to Professor Martin Lerch on the occasion of his 64th birthday.

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Table S1. Photocatalytic performance of TaON

		Photocatalytic half-reaction (WS)		Overall reaction (WS)			
HEP (co-catalyst)	OEP (co-catalyst)	Reaction conditions	Activity	Reaction conditions	Activity	Reference	Year
TaON (3 wt% Pt)	TaON (Ag^0)	10 vol.% methanol solution for H_2 evolution; 10 mM $AgNO_3$ aqueous solution and 200 mg La_2O_3 for O_2 evolution; under visible light (300 W Xe lamp), 400 mg of HEP and 400 mg of OEP	AQE = 0.2% in H_2 evolution; AQE = 34%, and rate 1650 $\mu mol \cdot g^{-1} \cdot h^{-1}$ in evolution of O_2	-	-	46	2002
TaON (0.05 wt% Ru)	-	80 vol.% methanol solution for H_2 evolution, under visible light (300 W Xe lamp), 400 mg of HEP	AQE = 0.8%, and 300 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 evolution rate in aqueous methanol solution and AQE = 2.1% in aqueous ethanol solution.	-	-	86	2003
TaON (3 wt.% Pt)	TaON	20 vol.% methanol solution for H_2; 20 mM of $AgNO_3$ aqueous solution and 200 mg La_2O_3 for O_2 evolution; under visible light (300 W Xe lamp), 400 mg of HEP and 400 mg of OEP	Initial AQE 0.1% at 420-500 nm of H_2; initial evolution rate 500 $\mu mol \cdot g^{-1} \cdot h^{-1}$ of O_2 with AQE = 10%	-	-	89	2003
TaON (0.05 wt.% Ru)	-	80 vol.% methanol solution and 80 vol.% ethanol solution for H_2 evolution, under visible light (300 W Xe lamp), 400 mg of HEP	AQE 0.8% and H_2 evolution rate 300 $\mu mol \cdot g^{-1} \cdot h^{-1}$ in aqueous methanol, AQE 2.1% and H_2 evolution rate ~550 $\mu mol \cdot g^{-1} \cdot h^{-1}$ in aqueous ethanol.	-		87	2004
TaON (0.3 wt% Pt)	WO_3 (0.5 wt% Pt)	5 mM NaI of aqueous solution for H_2 under visible light (300 W Xe lamp), 200 mg of HEP	5 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	5 mM NaI aqueous solution; under visible light (300 W Xe lamp), 200 mg of HEP and 200 mg of OEP	AQE = 0.4% at 420 nm	201	2005
-	TaON	2 mM $FeCl_3$ of aqueous solution for O_2 evolution; under visible light (300 W Xe lamp); 200 mg of OEP	~10 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2	-	-	100	2005
TaON (3 wt% Pt)	TaON	10 vol.% methanol solution for H_2 evolution; 10 mM $AgNO_3$ aqueous solution and 200 mg La_2O_3 for O_2 evolution; 400 mg catalyst	12.5 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 evolution; 225 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2 evolution	-	-	19	2007
m-ZrO_2/TaON (0.05 wt% Ru)	WO_3 (0.5 wt% Pt)	80 vol.% methanol solution for H_2 evolution; 10 mM $AgNO_3$ aqueous solution and 200 mg La_2O_3 for O_2 evolution; 400 mg of HEP and 400 mg of OEP	~12 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 evolution rate	1 mM NaI aqueous solution, under visible light (300 W Xe lamp); 200 mg of HEP and 200 mg of OEP	~20 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2;~10 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2	202	2008
TaON (0.3 wt% Pt)	TaON (0.3 wt% RuO_2)	1 mM NaI aqueous solution for H_2 evolution; 1 mM $NaIO_3$ aqueous solution for O_2 evolution; under visible light (300 W Xe lamp), 50 mg of HEP and 50 mg of OEP	66 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2; 460 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2	1 mM NaI aqueous solution; aqueous solution for O_2 evolution; 50 mg of HEP and 50 mg of OEP	AQE = 0.1-0.2% at λ>420 nm	91	2008
$Zr_xTa_{1-x}O_{1+x}N_{1-x}$ (0.05 wt% Ru)	-	80 vol.% methanol solution, under visible light (300 W Xe lamp), 400 mg of HEP	~250 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	-	-	122	2009
ZrO_2/TaON (1.0 wt% Pt)	WO_3 (0.5 wt% Pt)	For H_2 evolution half-reaction: Pt/ZrO_2/TaON (50 mg) in 100 mL aqueous NaI solution (1.0 mM); For O_2 evolution half-reaction: Pt/WO_3 (100 mg) in 100 mL aqueous $NaIO_3$ solution (1.0 mM)	H_2 evolution 29.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$	Z-scheme system: Pt/ZrO_2/TaON (50 mg) + Pt/WO_3 (100 mg) in 100 mL aqueous NaI solution (1.0 mM) as redox mediator (IO_3^-/I^- shuttle). Xenon lamp (300 W) with cold mirror and L42 cutoff filter for visible light (420 < λ < 800 nm)	At optimal NaI concentration (1.0 mM) and pH = 5.4: H_2 = 150 $\mu mol \cdot g^{-1} \cdot h^{-1}$, O_2 = 38 $\mu mol \cdot g^{-1} \cdot h^{-1}$. AQE = 6.3 % at 420 nm	22	2010
ZrO_2/TaON (1.0 wt % Pt)	TaON (0.5 wt % RuO_2)	H_2 evolution: 50 mg photocatalyst in 100 mL aqueous NaI solution (1.0 mM); O_2 evolution: 50 mg photocatalyst in 100 mL aqueous $NaIO_3$ solution (1.0 mM)	H_2 evolution: Pt/ZrO_2/TaON - 58 $\mu mol \cdot g^{-1} \cdot h^{-1}$; O_2 evolution: RuO_2/TaON - 260 $\mu mol \cdot g^{-1} \cdot h^{-1}$	50 mg each of Pt/ZrO_2/TaON (HEP) and RuO_2/TaON (OEP) in 100 mL aqueous NaI solution (0.2 mM), Pyrex top-irradiation vessel, Xe lamp (300 W) + cold mirror (CM-1), cutoff filter (L42), λ = 420–800 nm	146.7 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2; 73.3 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2	187	2011
Pt-TaON (0.3 wt % Pt)	PtO-WO_3 (0.5 wt % Pt)	H_2 evolution half-reaction: 0.2 g Pt–TaON in aqueous NaI solution (10 mM, pH 5.3; O_2 evolution half-	~81.67 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 evolution at pH 5.3	0.2 g Pt–TaON + 0.3 g PtO–WO_3 in aqueous NaI solution (5 mM)	AQE = 0.5 % at 420 nm	93	2011

		reaction: 0.3 g PtO-WO_3 in aqueous solution ($NaIO_3$ 2 mM + NaI 5 mM					
CdS@TaON (1 wt% CdS)	-	HEP = 0.2 g dispersed in 200 mL aqueous solution containing Na_2S (5 mL, 0.1 M) and Na_2SO_3 (5 mL, 0.04 M)	CdS@TaON (1 wt% CdS) + 0.4 wt% Pt: 1530 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2, AQE = 15% at 420 nm	-	-	198	2012
mac-TaON	-	10 vol.% methanol solution for H_2 evolution; HEP 40 mg	H_2 evolution rate: 212.5 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	126	2012
ZrO_2/TaON (0.5 wt% Pt)	Pt/WO_3 (0.5 wt %)	10 vol.% methanol solution for H_2 evolution; HEP 100 mg	H_2 evolution rate: 445 $\mu mol \cdot g^{-1} \cdot h^{-1}$; AQE: 1.7% at 420 nm	-	-	125	2012
TaON - (II) (Zn-TPPD) (0.1 wt% PtO_x)	TaON	H_2 formation: 0.24 M Na_2S aqueous solution (sacrificial electron donor) and O_2 formation: 0.05 M $AgNO_3$ aqueous solution; 100 mg of HEP and 100 mg OEP	H_2 formation: 95.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	186	2012
$IrO_2/Cr_2O_3/RuO_x/ZrO_2$/TaON (3.0 wt% Ru)		-	-	Catalyst: 200 mg $IrO_2/Cr_2O_3/RuO_x/ZrO_2$/TaON Reactant solution: 400 mL pure water Light source: High-pressure mercury lamp (450 W)	AQE ~0.1 % at 420 nm	188	2013
-	TaON	0.1 g β-TaON + 0.2 g La_2O_3 dispersed in 250 mL aqueous $AgNO_3$ solution (0.01 M), pH maintained at 8	O_2 evolution: 220 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	103	2013
γ-TaON (0.1 wt% Ru)	-	10 vol.% methanol solution for H_2 evolution, pH=7, 300 mg of HEP	H_2 evolution rate: 1272 $\mu mol \cdot g^{-1} \cdot h^{-1}$; AQE $\lambda > 420$ nm: 9.5 %	-	-	20	2013
TaON (3 wt% Pt)	TaON	10 vol.% methanol solution for H_2 evolution, O_2 evolution: 0.20 g La_2O_3 in 0.01 M $AgNO_3$ aqueous solution; 200 mg of HEP and 200 mg of OEP	H_2: up to 64.5 $\mu mol \cdot g^{-1} \cdot h^{-1}$; O_2: up to 308 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	105	2014
γ-TaON (1 wt% MoS_2–CdS)	-	Mixed aqueous solution containing 0.35 M Na_2S + 0.25 M Na_2SO_3. HEP: 200 mg	H_2: 1728 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	113	2014
CQDs/H-γ-TaON	-	10 vol.% methanol solution for H_2 evolution, 300 mg of HEP	H_2: 1655 $\mu mol \cdot g^{-1} \cdot h^{-1}$; (AQE): 12.2 % at 420 nm	-	-	21	2015
$MgTa_2O_{6-x}N_y$/TaON (0.4 wt% Pt)	WO_3 (0.45 wt% PtO_x)	-	-	HEP: 75 mg; OEP:150 mg; 150 mL aqueous NaI solution (1.0 mM)	H_2: 1444 $\mu mol \cdot g^{-1} \cdot h^{-1}$, O_2: 368.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$; AQE = 6.8% at 420 nm	197	2015
TaON/Bi_2O_3	-	20 vol.% methanol solution for H_2 evolution; 50 mg of HEP	1360 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	-	-	177	2015
TaON + $Ni(OH)_2$	-	10 vol.% methanol solution for H_2 evolution; 100 mg of HEP	H_2 evolution 31.5 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	171	2015
γ-TaON (0.1 wt% Pt)	-	10 vol.% methanol solution for H_2 evolution; 300 mg of HEP	1097 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2; AQE: 7.5% at 420 nm	-	-	51	2015
$Mg_{0.05}Ta_{0.95}O_{1.15}N_{0.85}$ (0.1 wt% Pt or 0.1 wt% Ru)	-	25 vol.% methanol solution for H_2 evolution; 150 mg of HEP	Pt: 23.3 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 Ru: 846.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	-	-	54	2016
-	TaON/Ta_3N_5	10 mM $AgNO_3$ aqueous solution, 200 mg La_2O_3, 100 mg of OEP	O_2 evolution rates: 20.1 $\mu mol \cdot g^{-1} \cdot h^{-1}$ (Ca^{2+}/urea = 0.10), 33.2 $\mu mol \cdot g^{-1} \cdot h^{-1}$ (Ca^{2+}/urea = 0.50), 46.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$ (Ca^{2+}/urea = 0.25)	-	-	135	2016
Ta_3N_5@NaTaON (1 wt% Pt)	Ta_3N_5@NaTaON	O_2 evolution: 50 mg photocatalyst suspended in 200 mL aqueous solution containing sodium persulfate ($Na_2S_2O_8$); H_2 evolution: 50 mg photocatalyst with 1 wt% Pt, suspended in aqueous methanol solution	10920 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2 at NaOH 0.1 M	-	-	176	2017
-	TaON + $Ru(OH)_xCly$ (1.0 wt% Ru and 0.1 wt% Co)	1 mM $NaIO_3$ of aqueous solution for O_2 evolution; 50 mg of OEP	250 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2 evolution	-	-	101	2017
ZrO_2/TaON (0.7 wt%	Ta_3N_5 (1 wt% Ir)	-	-	Aqueous solution containing NaI (0–4	H_2 = 41.6	203	

Pt)				mM) and $NaIO_3$ (0–2 mM); 120 mg HEP and 40 mg OEP	$\mu mol \cdot g^{-1} \cdot h^{-1}$; O_2 = 62.5 $\mu mol \cdot g^{-1} \cdot h^{-1}$		2018
-	TaON	50 mL aqueous solution of 40 mg OEP, 85 mg $AgNO_3$, 30 mg La_2O_3, pH = 7.5. 150 W Xe lamp, λ > 400 nm.	67.5 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2	-	-	24	2019
ZnS/CdS/γ-TaON	-	100 mg photocatalyst dispersed in 100 mL aqueous solution containing 0.35 M Na_2S and 0.25 M Na_2SO_3	839.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	-	-	114	2019
Pt/ZrO_2/TaON (0.5 wt% Pt)	TaON (0.05 wt% Ru)	O_2 evolution: $NaIO_3$ (1 mM), 50 mg of OEP	O_2 evolution rate: 860 $\mu mol \cdot g^{-1} \cdot h^{-1}$, (AQE) at 420 nm: 6.9%	Z-scheme two-step water splitting, Aqueous solution containing NaI (0.5 mM); 50 mg of HEP and 50 mg of OEP	208 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2; 104 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2	94	2019
γ-TaON (1 wt% Pt)	-	Aqueous triethanolamine (TEOA) solution, 300 W Xe lamp	1393.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	-	-	136	2019
TaON@Ta_2O_5 (Rh)	-	20 vol.% methanol solution for H_2 evolution; 200 mg of HEP	39.41 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 evolution	-	-	178	2020
TaON/$Cd_{0.5}Zn_{0.5}S$ (0.5 wt% NiS)	-	Mixed solution containing 0.35 M Na_2S + 0.25 M Na_2SO_3; 50 mg of HEP	H_2 evolution rate: 34800 $\mu mol \cdot g^{-1} \cdot h^{-1}$; AQE 25.5% at 420 nm	-	-	88	2020
Ta_2O_5@TaON@Ta_3N_5 (Rh)	-	20 vol% methanol; 300 W Xe lamp with λ > 420 nm cutoff filter	83.64 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	116	2020
TaON	-	50 mg HEP dispersed in 60 mL water + 5 mL triethanolamine (TEOA)	25 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	-	-	130	2021
-	TaON (0.15 wt% CoO_x)	25 mg catalyst; 50 mg La_2O_3 (pH buffer, maintains pH 8.5); 150 mg $AgNO_3$	6100 $\mu mol \cdot g^{-1} \cdot h^{-1}$; (AQE) = 21.2 % at 420 nm	-	-	185	2021
TaON/CdS (2 wt% Pt)	-	10 mg of HEP; aqueous solution containing 10 mL lactic acid (10% v/v)	19290 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2; AQE at 420 nm = 18.23%	-	-	191	2022
Zr-TaON/Ta_3N_5 (Ru 4 wt%) / Cr_2O_3 4 wt%)	Zr-TaON/Ta_3N_5 (0.6 wt% IrO_2)	-	-	pH 8.0, adjusted with NaOH(aq.); 150 mg of HEP and OEP, under visible light irradiation λ > 380 nm	AQE = 0.66% at 420 nm; STH = 0.009%	124	2022
-	TaON	200 mL distilled water + 100 mg La_2O_3 (pH=8); $AgNO_3$, 1.2 mmol; OEP: 100 mg	2500 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2 evolution	-	-	104	2022
SiO_2@TaON@ Ta_3N_5 (Pd/PdO)	SiO_2@TaON@Ta_3N_5 (RuO_2)	-	-	30 mg of HEP and OEP, 100 mL deionized water w/ no sacrificial agent, 300 W Xe lamp with 420 nm cut-off filter	H_2: 473.52 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2: 83.88 $\mu mol \cdot g^{-1} \cdot h^{-1}$ AQE = 0.253% at 420 nm	115	2023
ZrO_2/$MgTa_2O_{6-x}N_x$ Zr/Ta = 0.10 (0.2 wt% Pt)	ZrO_2/$MgTa_2O_{6-x}N_x$ Zr/Ta = 0.05 (1.0 wt% CoO_x)	100 mg of HEP in aqueous ascorbic acid solution (10 $mmol \cdot L^{-1}$); 100 mg of OEP in $AgNO_3$ solution (50 $mmol \cdot L^{-1}$), pH = 8.5 + 100 mg La_2O_3	H_2 evolution rate: 2980 $\mu mol \cdot g^{-1} \cdot h^{-1}$; O_2 evolution rate: 1880 $\mu mol \cdot g^{-1} \cdot h^{-1}$	-	-	123	2023
TaON/CdS	-	40 mg of HEP, 0.35 M Na_2S + 0.25 M Na_2SO_3 in 40 mL distilled water	277000 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 evolution rate; (AQE) at 400 nm = 12.2%	-	-	172	2023
CdZnS (12 wt% TaON)	-	10 mg of HEP; aqueous solution containing 10 mL lactic acid, TaON acted as co-catalyst	7430 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2; AQE at 420 nm = 20.12%	-	-	173	2024
TaON (2 wt% Pt)	-	10 mg of HEP; 2 mL methanol (10 vol%)	275 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2 at 343 nm cut-off irradiation	-	-	127	2024
$SrTiO_3$:Rh	TaON (IrO_2 0.75 wt%)	Aqueous ascorbic acid (10 mM) and 30 mg of HEP; Aqueous $AgNO_3$ (10 mM); and 30 mg of HEP, and 30 mg of OEP	4166 $\mu mol \cdot g^{-1} \cdot h^{-1}$ O_2; 390 $\mu mol \cdot g^{-1} \cdot h^{-1}$ H_2	Z-scheme system 43 mg OEP + 37 mg HEP; 100 mL ultrapure water, pH adjusted to 3 with H_2SO_4	At pH = 3, H_2 = 21.6 $\mu mol \cdot g^{-1} \cdot h^{-1}$, O_2 = 9.3 $\mu mol \cdot g^{-1} \cdot h^{-1}$	139	2024

Table S2. Photoelectrochemical performance of TaON

Photoanode (*fabrication method*)	Reaction conditions	Photocurrent density	IPCE/ABPE	H_2 and/or O_2 evolution	STH/HC-STH	Reference	Year
TaON (*sonoelectrochemical anodization*)	Reference electrode: Ag/AgCl, Electrolyte: 1 M KOH	2.6 mA·cm^{-2} at 1.52 V vs RHE, under AM 1.5 illumination	-	-	-	25	2009
TaON-IrO_2 (*electrophoretic deposition*)	Reference electrode: Ag/AgCl, Electrolyte: 0.1 M Na_2SO_4 (pH = 6)	-	~76% at 400 nm at 1.15 V vs. RHE	At 1.0 V applied bias, 25.7 μmol·h^{-1} H_2 (Pt wire) and 12 μmol·h^{-1} O_2	-	47	2010
TaON - IrO_2 (*electrophoretic deposition and post-necking method*)	Reference electrode: Ag/AgCl, Electrolyte: 0.1 M Na_2SO_4 (pH = 6)	1.2 mA·cm^{-2} at 0.6 V vs. Ag/AgCl	76% IPCE at 400 nm at 1.15 V vs. RHE	At 1.0 V applied bias, 21.7 μmol·h^{-1} H_2 (Pt wire) and 10.7 μmol·h^{-1} O_2	-	27	2011
β-TaON–Ta_3N_5 – N:Ta_2O_5 (*DC sputtering*)	Reference electrode: Ag/AgCl, Electrolyte: 0.1 M Na_2SO_4 (pH = 6)	0.25 mA·cm^{-2} at 1.23 V vs. RHE under AM 1.5 illumination	-	-	-	119	2012
TaON (*DC reactive sputtering*)	Reference electrode: Ag/AgCl; Electrolyte: 0.1 M Na_2SO_4 (pH = 7), 450 W xenon lamp with KG3 filter, simulating AM 1.5	30 μA·cm^{-2} at 1.23 V vs. RHE	-	-	-	23	2012
CoO_x/TaON (*electrophoretic deposition and post-necking method*)	Reference electrode: Ag/AgCl; Electrolyte: 0.1 M Na_2SO_4 (pH = 6 or 8) and 0.1 M sodium phosphate buffer (pH = 8)	-	42% at 400 nm, at 1.23 V vs. RHE	At 1.07 V applied bias, 134 μmol·h^{-1} H_2 (Pt), 67 μmol·h^{-1} O_2	-	169	2012
$CaFe_2O_4$/TaON (*electrophoretic deposition*)	Reference electrode: Ag/AgCl, Electrolyte: 0.5 M NaOH (pH = 13.7)	1.26 mA·cm^{-2} at 1.23 V vs. RHE	30% at 400 nm at 1.23 V vs. RHE	At 1.23 V applied bias, 41.13 μmol·h^{-1} H_2 (Pt mesh), 19.57 μmol·h^{-1} O_2; with Faradaic efficiencies of 80%	0.053% at 1 V vs. RHE	192	2013
γ-TaON (dip-coating)	Reference electrode: SCE, Electrolyte: 0.5 M Na_2SO_4	1.4 mA·cm^{-2} at 1.45 V vs. RHE	-	-	-	20	2013
Cu_2O/TaON (*vapor-phase hydrothermal treatment*)	Reference electrode: SCE, Electrolyte: 0.5 M NaOH (pH = 13.6)	4.36 mA·cm^{-2} at 1.23 V vs. RHE, under AM 1.5G illumination	59% at 400 nm at 1.0 V vs. RHE	At 1.0 V applied bias, H_2 = 46.5 μmol·h^{-1}·cm^{-2} (Pt foil), O_2 = 23.1 μmol·h^{-1}·cm^{-2}, with Faradaic efficiencies of H_2 = 93%, O_2 = 90%	-	112	2014
TaON (*anodization*)	Reference electrode: Ag/AgCl, Electrolyte: 1.0 M KOH	3.15 mA·cm^{-2} at 1.62 V vs. RHE (*multi-layered*)	~7.5% at 400-450 nm at 1.62 vs. RHE	-	-	26	2014
TiO_2-TaON (*two-step electrochemical anodization*)	Reference electrode: Ag/AgCl, Electrolyte: 0.1 M KOH (pH = 13)	2.45 mA·cm^{-2} at 1.86 V vs. RHE	25% at 380 nm at 1.86 V vs. RHE	At 0.9 V applied bias H_2 = 25 μmol·h^{-1} (Pt wire), O_2 = 9 μmol·h^{-1}, with Faradaic efficiency of 98% for H_2 evolution	-	118	2015
Ba-TaON – C_3N_4 - CoO_x (*vapor-phase hydrothermal treatment*)	Reference electrode: Ag/AgCl, Electrolyte: 1.0 M NaOH (pH = 13.6)	4.57 mA·cm^{-2} at 1.23 V vs. RHE under AM 1.5G illumination	62% at 400 nm at 1.23 V vs. RHE	At 1.0 V applied bias, H_2 = 52 μmol·h^{-1}·cm^{-2} (Pt mesh), O_2 = 25.9 μmol·h^{-1}·cm^{-2}, with Faradaic efficiencies: 96% (H_2) and 93% (O_2)	-	28	2015
CoO_x/TaON (*electrophoretic deposition*)	Reference electrode: Ag/AgCl, Electrolyte: 50 mM $NaHCO_3$ (pH = 8.3)	-	-	O_2 = 0.84 μmol·h^{-1} with a Faradaic efficiency of 89%	-	170	2016
TiO_2-TaON-MnO_x (*photo-assisted electrodeposition*)	Reference electrode: Ag/AgCl, Electrolyte: 0.1 M Na_2SO_4 (pH = 6)	250 μA·cm^{-2} at 0.95 V vs. RHE	8% at 1.0 V vs. RHE at 410 nm	-	-	194	2016
CoO_x/TiO_2–TaON (*post-necking*)	Reference electrode: Ag/AgCl; 0.1 M sodium borate buffer (pH = 9.2)	0.70 mA·cm^{-2} at 1.23 V vs. RHE under λ > 400 nm	50% at 1.5 V vs. RHE, > 410 nm	H_2 = 40 μmol·h^{-1} (Pt wire) and O_2 = 20 μmol·h^{-1} with 100% Faradaic efficiency	-	195	2016
NiO_x/TiO_2–TaON (*photo - electrodeposition*)	Reference electrode: Ag/AgCl; 0.10 M sodium borate buffer, pH = 9.2. Light source: 150 W Xe-arc lamp with AM 1.5G	0.75 mA·cm^{-2} at 0.9 V vs. RHE	7.5 % at 410 nm at 0.9 V vs. RHE	-	-	199	2016
CoO_x/TaON (*electrophoretic deposition*)	Reference electrode: Ag/AgCl, Electrolyte: 50 mM $NaHCO_3$ (pH = 6.6)	9.39 μA· cm^{-2} at 0.79 vs. RHE	-	O_2 = 0.133 μmol·h^{-1} with 70% Faradaic efficiency	-	193	2017
TaON (*reactive radiofrequency magnetron sputtering*)	Reference electrode: SCE, Electrolyte: 0.5 M Na_2SO_4	1.2 μA·cm^{-2} at 1.15 V vs RHE under visible light (λ > 450 nm)	-	0.0101 μmol·h^{-1} H_2 (Pt rod) evolution	-	168	2017
TaON (*electrophoretic deposition and post-necking*)	Reference electrode: RHE; 0.1 M potassium phosphate buffer, pH = 7.3; Co-catalyst: CoPi	0.59 mA·cm^{-2} at 1.23 V vs. RHE	-	-	-	24	2019
TaON (*double-step anodic oxidation*)	Reference electrode: 3 M KCl-Ag/AgCl, 1 M Na_2SO_3	0.1 mA·cm^{-2} at 1.09 V vs. RHE	-	27.3 μmol·h^{-1}·cm^{-2} H_2 (Pt wire)	-	117	2023