

Supporting Information

Effects of Annealing Conditions on the Catalytic Performance of Anodized Tin Oxide for Electrochemical Carbon Dioxide Reduction

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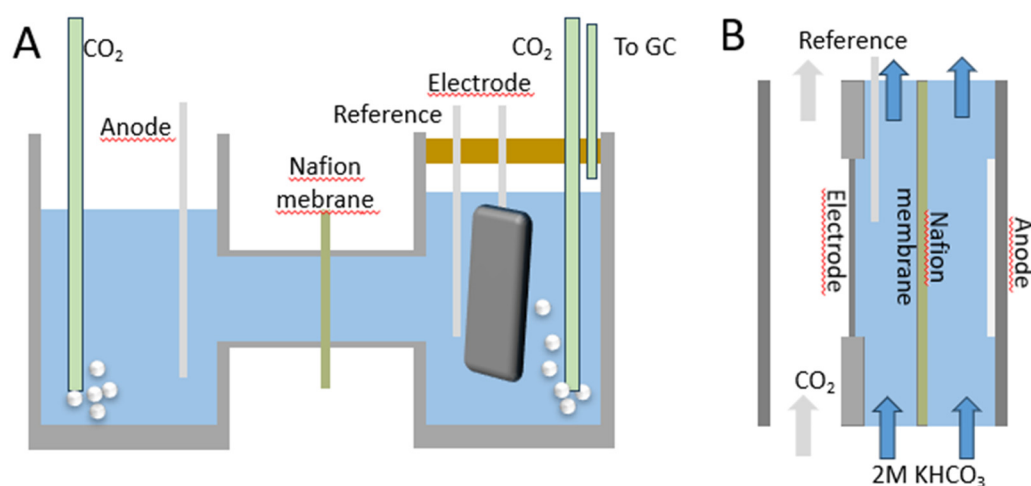


Figure S1. Electrochemical set up: A) H-cell configuration, (Disa Raffaele e F.lli snc) and B) flow cell.

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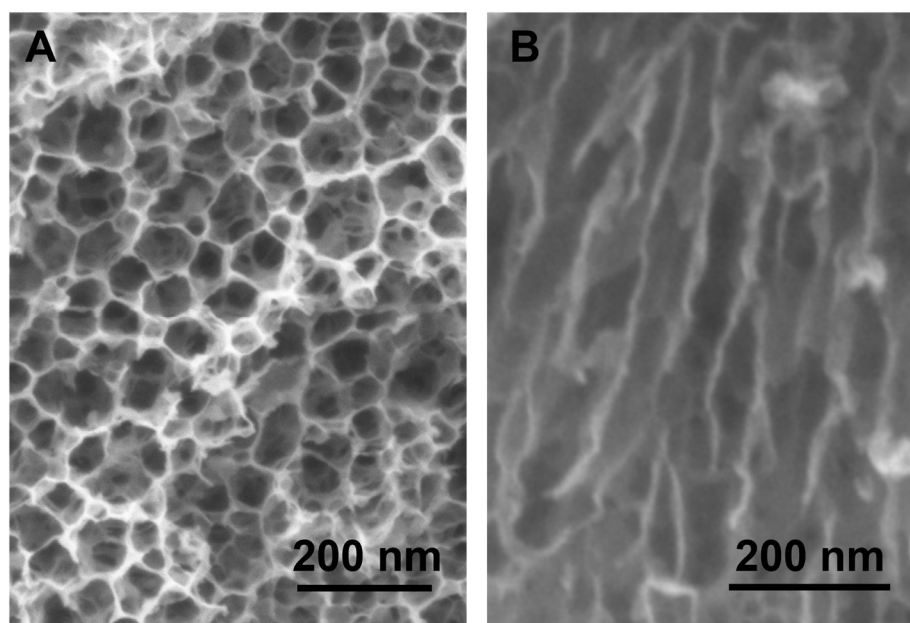


Figure S2. FESEM images of pristine catalyst: (A) top view and (B) cross-section view.

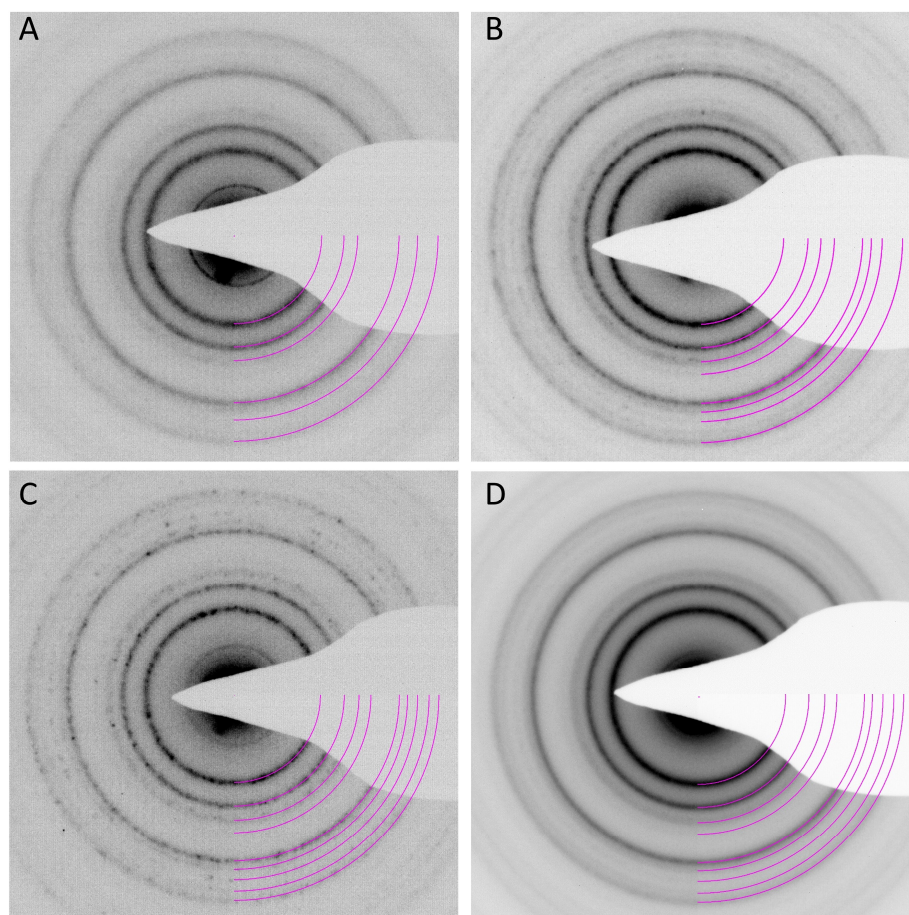


Figure S3. Selected Area Electron Diffraction (SAED) patterns of all studied catalysts: (A) Pristine, (B) Air'-370deg, (C) Air'-525deg and (D) N2'-525deg. The rings in the images were obtained by Circular Hough transform diffraction analysis (A software tool for automated measurement of selected area electron diffraction patterns within Digital Micrograph [1]), and are superimposed on the SAED pattern, showing the position and size of the rings. These are polycrystalline SnO₂ (Tin Oxide, JCPDS 00-041-1445).

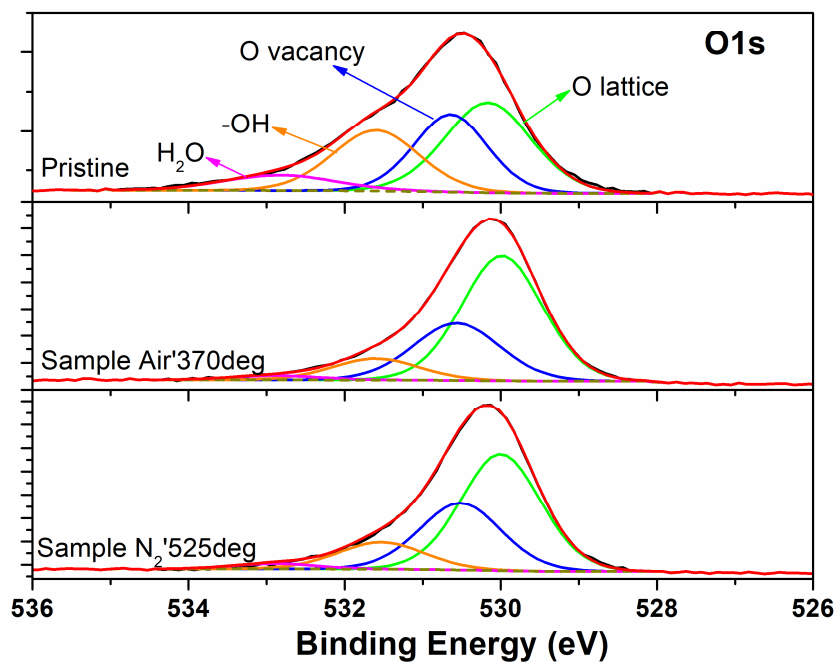


Figure S4. XPS O1s HR spectra for pristine, annealed in air at 370 °C and annealed in inert atmosphere at 525 °C.

Table S1. O 1s XPS peak deconvolution results for the four samples.

Samples	O1s XPS peak deconvolution results			
	Lattice O	O _{vac}	-OH	H ₂ O
Pristine	38.1	27.8	25.7	8.4
Air'370°C	58.5	28.5	10.7	2.3
Air'525°C	53.1	31.2	13.2	2.5
N ₂ '525°C	54.9	27.4	14.3	3.4

Table S2. Comparison of Electrocatalytic Performance of Tin-Based Catalysts for CO₂ Reduction to Formic Acid / formate and CO.

Electrocatalysts	Electrolyte	FE _{CO₂RR} [%]	Applied potential [V vs. RHE]	Current density [mA cm ⁻²]	Stability [h]	Ref
Mesoporous SnO _x Nanoparticles	2 M KHCO ₃	95	-1.2	72	30	This work
Wavy SnO ₂	0.5 M KHCO ₃	91	-1.0	22 S	18	[2]
Mesoporous SnO ₂ nanosheets	0.5 M KHCO ₃	90	-1.3	8.3	12	[3]
Porous SnO ₂ /CC	0.5 M NaHCO ₃	95	-1.6 (V vs. Ag/AgCl)	45	24	[4]
Porous SnO ₂ nanosheets	0.5 M KHCO ₃	92.4	-0.7	NA	10	[5]
Ultra-small SnO ₂ NPs	1 M KHCO ₃	80	-1.21	145	NA	[6]
Ultrathin SnO ₂ QWs	0.1 M KHCO ₃	87.3	-1.156	13.7	7	[7]
Pt atom/SnO ₂	0.1 M KHCO ₃	82.1 ± 1.4	-1.2	12.9	8	[8]
In-SnO ₂ NWs	0.5 M KHCO ₃	85	-1.04	6.02	12	[9]
Mn-doped SnO ₂	0.1 M KHCO ₃	91.6	-1.03	21.2	8	[10]
VO-rich N-SnO ₂ NS	0.1 M KHCO ₃	>90	-0.9	6.7	10	[11]
SnO ₂ @N-CNw	0.5 M NaHCO ₃	90	-0.8	25	20	[12]
NC-SnO ₂ @CC	0.5 M KHCO ₃	93	-0.7	44.3	24	[13]
SnO ₂ /Sn	0.5 M KHCO ₃	93 ± 1	-1.0	28.7	9	[14]
SnO ₂ /Py-CNTO	0.1 M KHCO ₃	96	-1.29	27.5	32	[15]

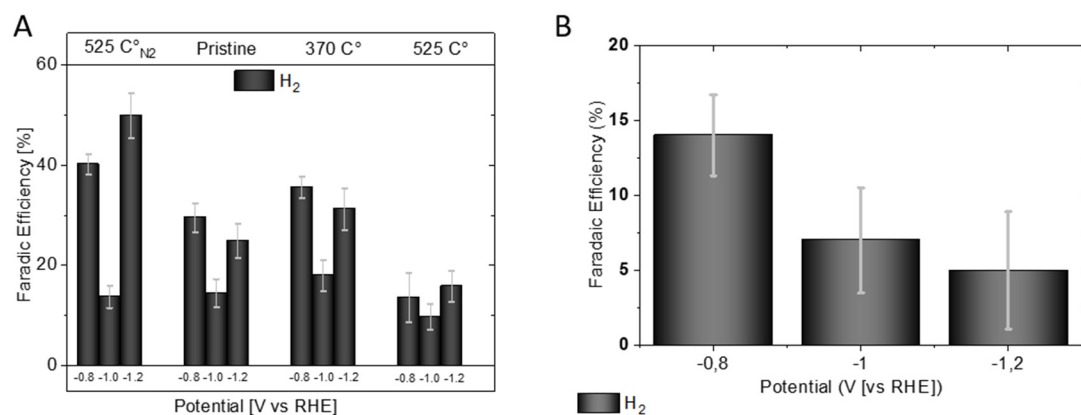


Figure S5. FE of H₂ of: A) H-cell experiments and B) flow cell experiments.

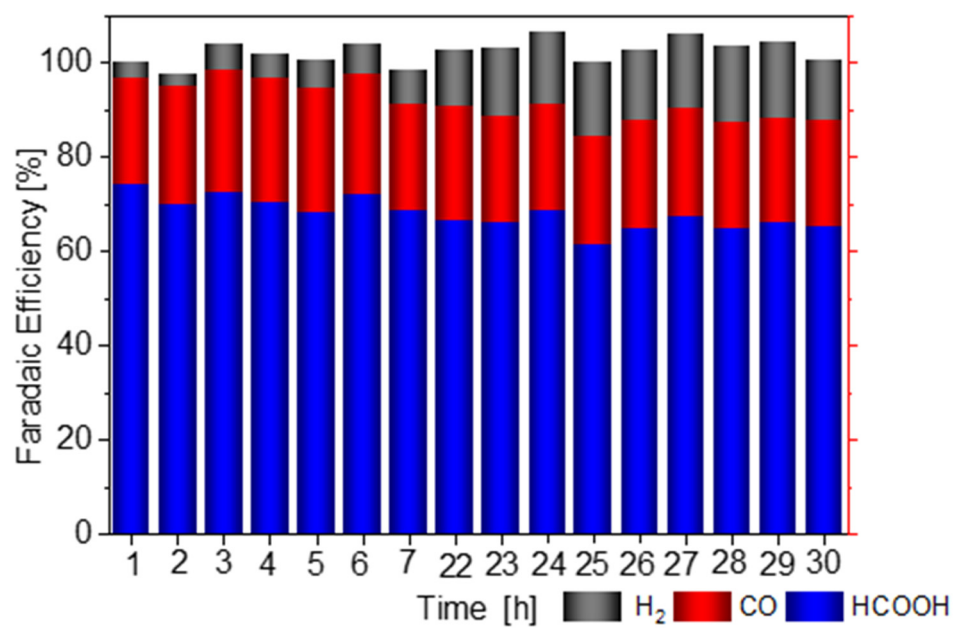


Figure S6. Stability test complete FE distribution at sampling time.

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