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- Supplementary Information -

2 **Fabrication of a Novel Tin Gas Diffusion Electrode for**

3 **Electrochemical Reduction of Carbon Dioxide to Formic Acid**

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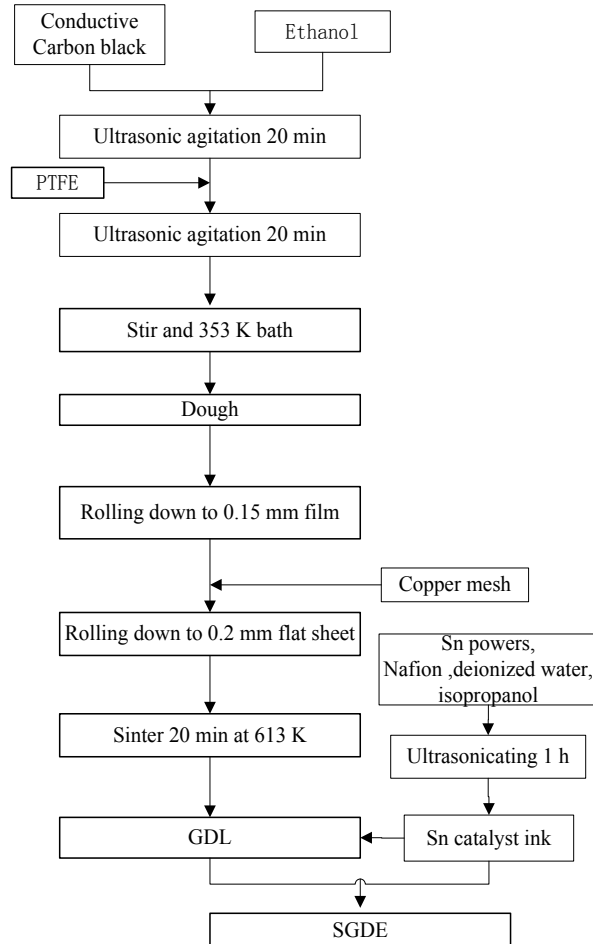
24 **Table S1** Simulated data of equivalent circuits for the Nyquist plots of the SGDEs
 25 with different Sn loadings.

Element	3 mg cm ⁻²	5 mg cm ⁻²	7 mg cm ⁻²	9 mg cm ⁻²
$R_s(\Omega)$	1.459	1.392	1.290	1.440
$R_1(\Omega)$	1.241	1.255	1.222	1.246
$R_2(\Omega)$	7.588	7.078	6.453	6.724

26 **Table S2** Simulated data of equivalent circuits for the Nyquist plots of the SGDEs
 27 with different Nafion fractions.

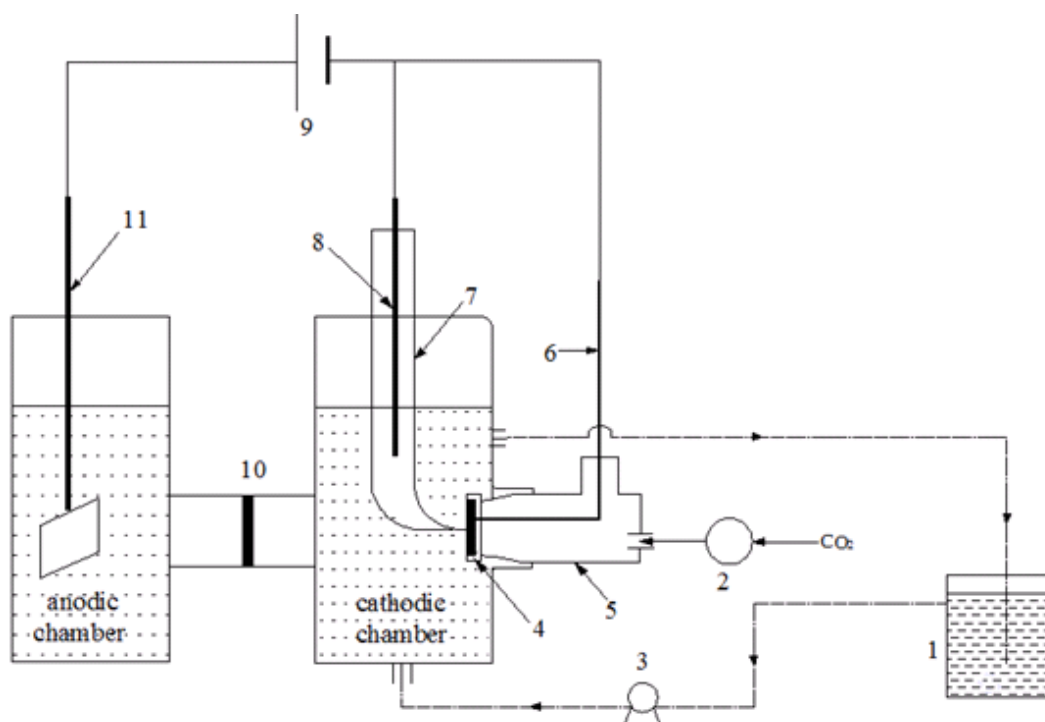
Element	20 wt%	33 wt%	50 wt%	60wt%
$R_s(\Omega)$	1.438	1.278	1.392	1.262
$R_1(\Omega)$	1.381	0.990	1.255	1.052
$R_2(\Omega)$	8.522	7.654	7.078	4.649

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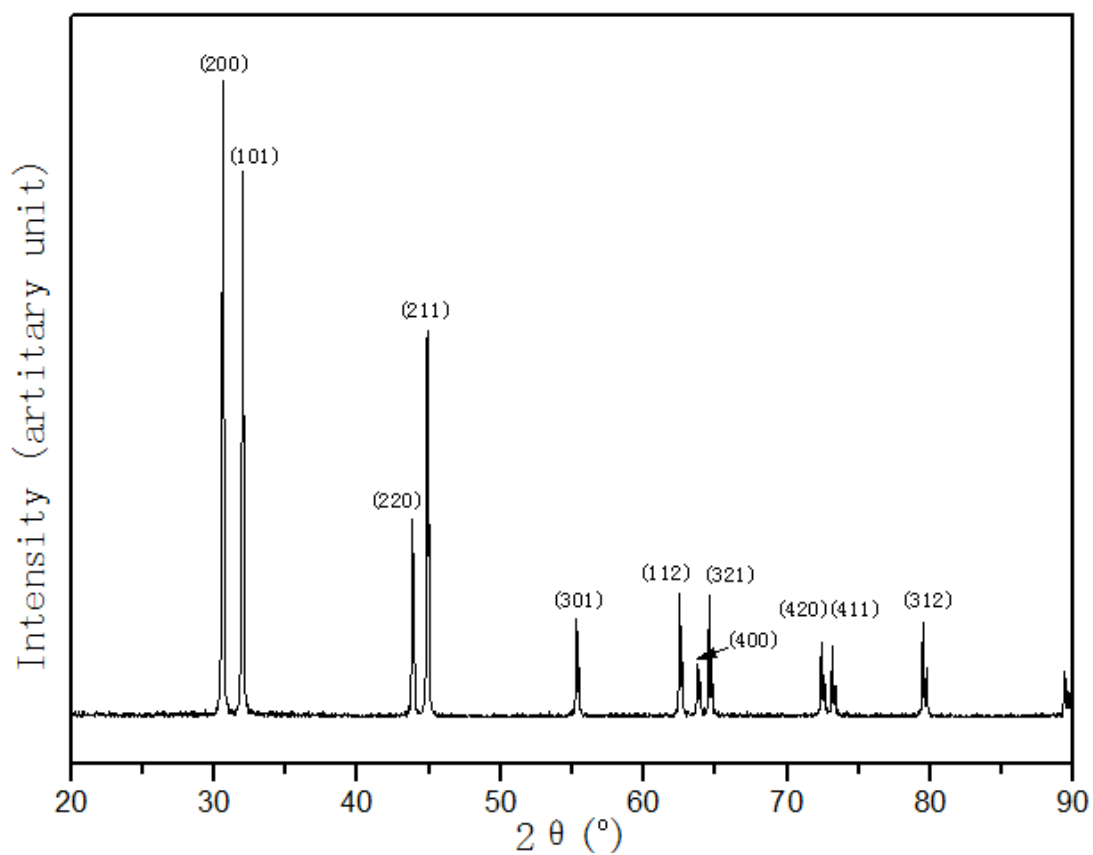
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30 **Figure S1** Fabrication procedure of the SGDE.

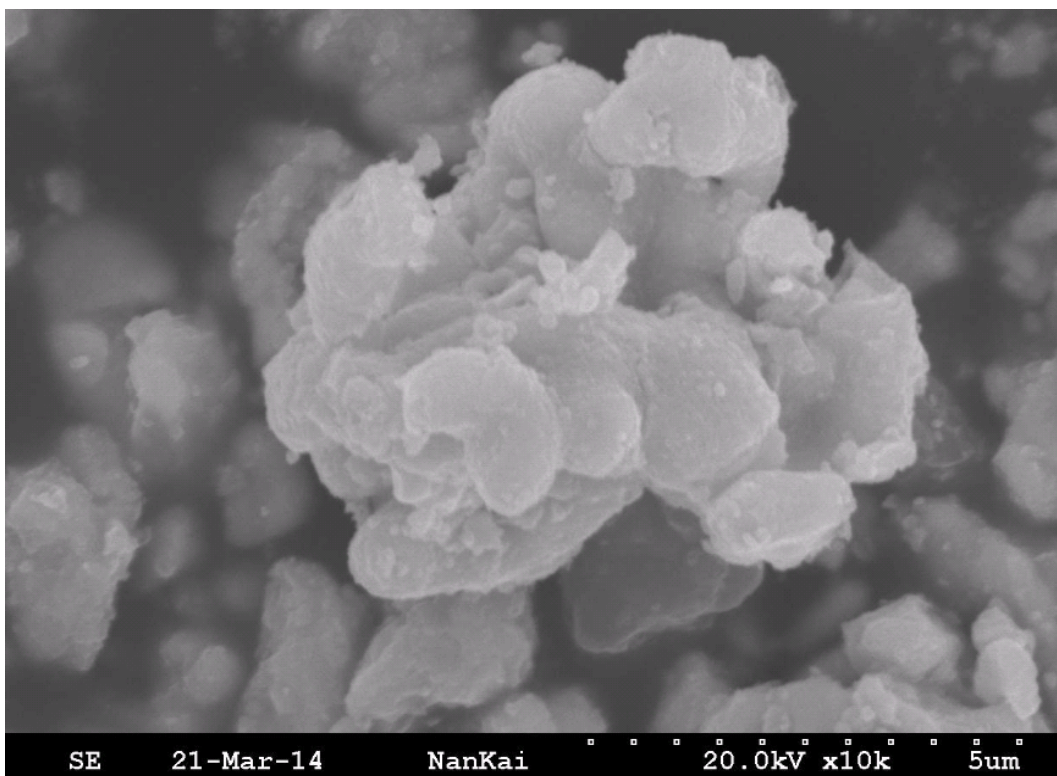


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 32 1 Electrolyte, 2 Flowmeter, 3 Pump, 4 Working electrode (SGDE), 5 Gas chamber, 6 Titanium wire, 7
 33 Luggin capillary, 8 Ag/AgCl electrode, 9 Electrochemical workstation, 10 PEM, 11 Counter electrode.

34 **Figure S2** Schematic overview of the three-compartment electrochemical cell.

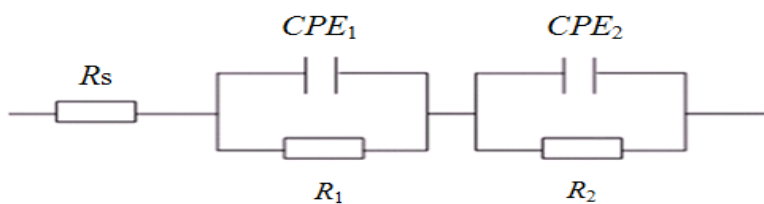


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 36 **Figure S3** XRD pattern of the as-prepared catalyst particles.



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38 **Figure S4** SEM image of the as-prepared catalyst particles.



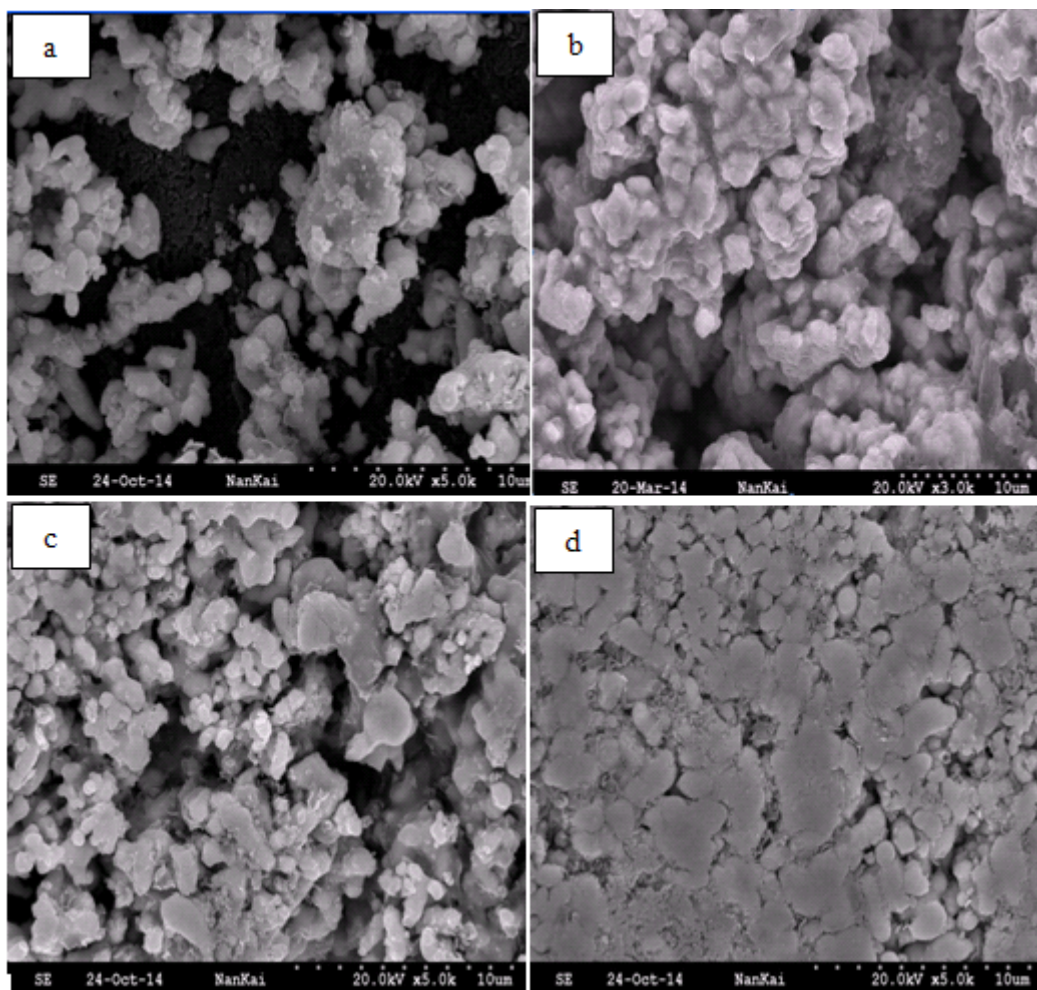
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40 **Figure S5** Equivalent circuit used for fitting of the impedance. R_s : solution

41 resistance, R_1 : ohm resistance, R_2 : charge transfer resistance, CPE_1 and CPE_2 : constant

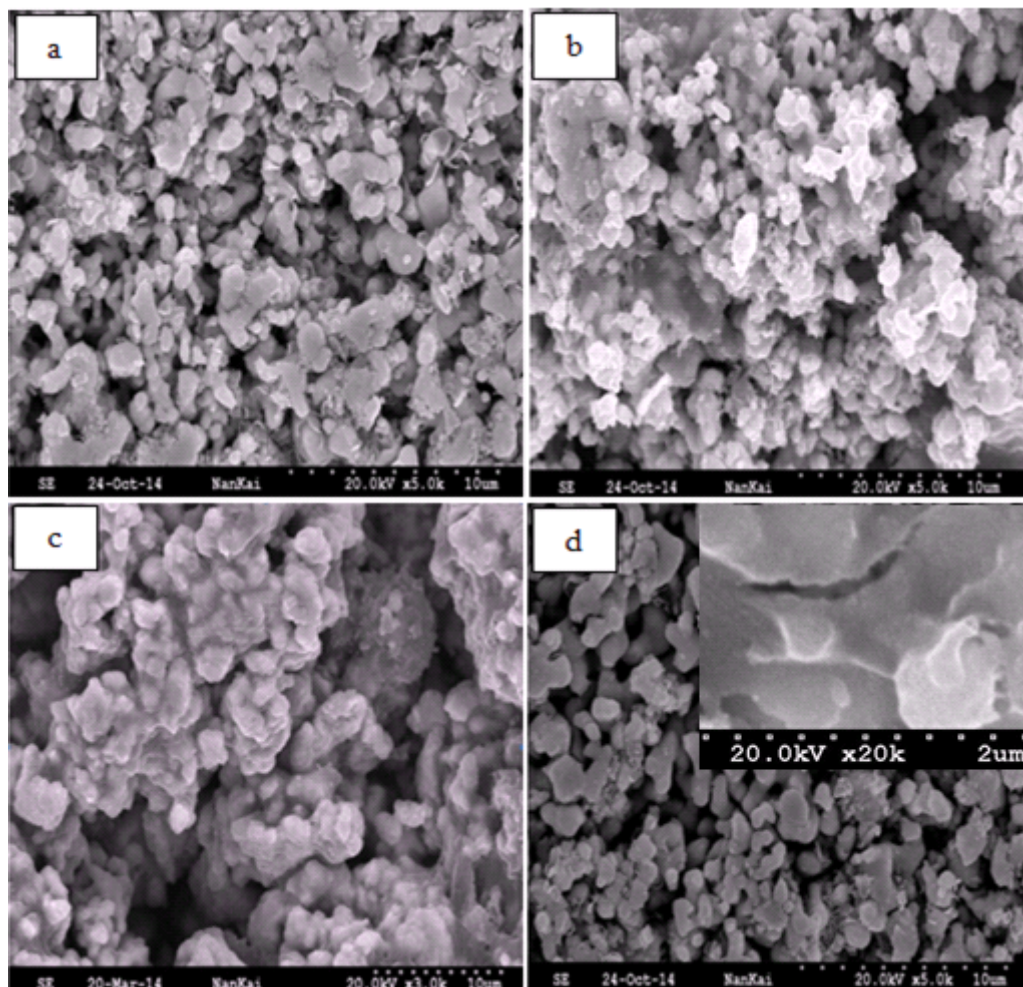
42 phase element.

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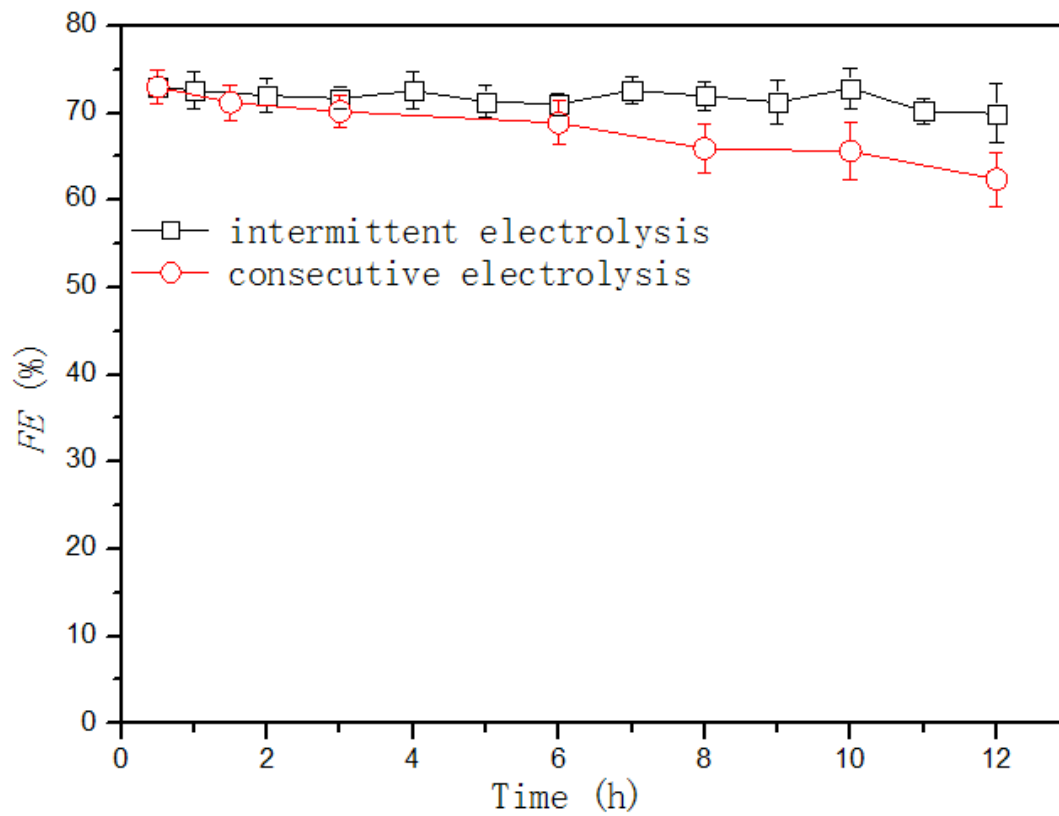
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45 **Figure S6** SEM image of the SGDEs with different Sn loadings. (a) 3 mg cm⁻², (b) 5
46 mg cm⁻², (c) 7 mg cm⁻² and (d) 9 mg cm⁻².



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48 **Figure S7** SEM image of the SGDEs with different Nafion fractions. (a) 20 wt%, (b)
49 33 wt%, (c) 50 wt% and (d) 60 wt%, the insert plot shows high-resolution SEM image
50 of the SGDE with Nafion fraction of 60 wt%.



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52 **Figure S8** The long term performance of ERCF with the optimal SGDE using two
53 electrolysis models: consecutive electrolysis and intermittent electrolysis with 3 h in
54 each run.