

Materials List for:

Synthesis and Performance Characterizations of Transition Metal Single Atom Catalyst for Electrochemical CO₂ Reduction

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URL: <https://www.jove.com/video/57380>

DOI: [doi:10.3791/57380](https://doi.org/10.3791/57380)

Materials

Name	Company	Catalog Number	Comments
syringe pump	KD Scientific	KDS-100	
tube furnace	Lindberg/Blue M	TF55035A-1	
ball miller	SPEX SamplePrep	5100	
electrochemical work station	BioLogic	VMP3	
pH meter	Orion	320 PerpHecT	2 points calibration before use
gas chromatograph	Shimadzu	GC-2014	a combined separation system consisting of molecular sieve 5A, Hayesep Q, Hayesep T, and Hayesep N
mass flow controller	Alicat Scientific	MC-50SCCM-D/5M	
ultrapure water system	Millipore	Synergy	
vacuum desiccator	PolyLab	55205	
polyacrylonitrile	Sigma-Aldrich	181315	M _w =150,000
polypyrrolidone	Sigma-Aldrich	437190	M _w =1,300,000
Ni(NO ₃) ₂ ·6H ₂ O	Sigma-Aldrich	244074	
dicyandiamide	Sigma-Aldrich	D76609	
dimethylformamide	Sigma-Aldrich	227056	
carbon fiber paper	AvCarb	MGL370	
Nafion 117 membrane	Fuel Cell Store	117	used as proton exchange membrane in H-cell
KHCO ₃	Sigma-Aldrich	431583	further purified by electrolysis
platinum foil	Beantown Chemical	126580	
saturated calomel electrode	CH Instruments	CHI150	
glassy carbon electrode	HTW GmbH	SIGRADUR	1 cm × 2 cm
wax	Apiezon	W-W100	
Nafion 117 solution	Sigma-Aldrich	70160	used as ionomer in catalyst ink preparation
forming gas	Airgas	UHP	5% H ₂ balanced with Ar
carbon dioxide	Airgas	LaserPlus	
standard gas	Airgas	customized	500 ppm CO, 500 ppm CH ₄ , 1000 ppm H ₂ balanced with Ar
standard gas	Air Liquide	customized	100 ppm H ₂ , 100 ppm CO and other alkanes balanced with Ar