Organizational Information for CO_2 reduction Tafel slopes dataset

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Dataset Organization

In this study, we manually digitized Tafel data included in several different papers from the electrochemical CO_2 reduction literature. Often, a single paper may report multiple sets of Tafel data, possibly with many traces in the same figure. Each distinct paper that reports (possibly multiple) Tafel data(sets) receives a unique three-digit identifier, which will be referred to as `PaperID`. Note that `PaperID`s are *not* guaranteed to be consecutive, and some numbers are skipped. Within each paper, each dataset receives a separate three-digit identifier (unique within the same `PaperID`), which will be referred to as `SetID`. A single Tafel dataset in our study, then, is uniquely identified by the tuple (`PaperID`, `SetID`).

Our entire zipped dataset is organized into a hierarchical directory structure, with each directory named according to the `PaperID` identifier. Each individual paper directory contains several files. First, we include files with names of the form `figure*.png`, which are raw Portable Network Graphics (PNG) images of the paper figures, screenshotted manually from PDF copies of the papers. A few paper directories have multiple figure screenshots, and they are named according to `figure1.png`, `figure2.png`, etc. Directories also include raw data files with names of the form `dat_<SetID>.txt`, which contain raw x, y data taken from manually digitizing the figure. Associated with each raw data file is a separate metadata file with a name of the form `metadata_<SetID>.txt`. The metadata files contain key-value pairs stored in the YAML Ain't Markup Language (YAML) format, and contain several pieces of information required for processing the raw x, y data. YAML parsers are available in several programming languages, and the official YAML standard is documented at `https://yaml.org/`.

Metadata Tags

Tags in a metadata file are associated with YAML keys, and their associated values have several types. The types of the values, as well as the information they carry, are documented in Table 1. Note that for CO_2 reduction catalysis, more negative applied electrochemical potentials correspond to more positive overpotentials. Studies in the literature report either the applied electrochemical potential or the overpotential on their voltage axis. The `v_reversed` tag contains the information required to properly orient the voltage data in the direction of increasing overpotential for each dataset.

Table 1: Table describing the types and meanings of the key-value pairs in the metadata files associated with each Tafel dataset.

Tag Name	Value Type	Value Meaning
`xdat`	Enum[`'current'`, `'voltage'`]	Indicates which data is reported on the x axis.
`xunit`	`String`	String describing units of measurement for the x axis data, for example `mV` or `mA/cm2`.
`xlog`	`Bool`	Indicates whether the x axis data is reported on a logarithmic scale.
`ydat`	Enum[`'current'`, `'voltage'`]	Indicates which data is reported on the y axis.
`yunit`	`String`	String describing units of measurement for the y axis data, for example `mV` or `mA/cm2`.
`ylog`	`Bool`	Indicates whether the y axis data is reported on a logarithmic scale.
`rval`	`Float`	Reported Tafel slope value.
`rerr`	Union[`Float`, `None`]	Error in reported Tafel slope value, if reported. If not reported, then `None`.
`runit`	`String`	String describing units of measurement for the x axis data, for example `mV/dec`.
`v_reversed`	`Bool`	If `false`, then the voltage data increases in value with increasing direction of the axis. If `true`, then the voltage data decreases in value with decreasing direction of the axis.
`i_reversed`	`Bool`	If `false`, then the current data increases in value with increasing direction of the axis. If `true`, then the current data decreases in value with decreasing direction of the axis.
`cat_tags`	List[`String`]	A list of tags describing the catalyst material. For example, a CuO catalyst would get the tags [`'Cu'`, `'O'`].

Analyzed Papers

Table 2 documents the literature sources of all Tafel datasets analyzed in this study.

Table 2: Provenance of all Tafel datasets analyzed in this study. The `PaperID` defines the unique identifier assigned to the paper in the zipped dataset.

`PaperID`	Data Location	Document Object Identifier (DOI)
000	Figure 5	10.1021/ja5065284[1]
002	Figure 4	10.1021/ja309317u[2]
004	Figure 4	10.1246/bcsj.68.1889[3]
005	Figure 4	10.1002/anie.201604654[4]
009	Figure 5B	10.1021/acsnano.5b01079[5]
010	Figure 4B	10.1002/anie.201713003[6]
011	Figure 1C	10.1021/jacs.7b09074[7]
012	SI Figure 8	10.1002/anie.201900499[8]
014	Figure 10	10.1002/smll.201701809[9]
015	Figure 6D	10.1088/1361-6528/aa8f6f[10]
016	Figure 7A	10.1021/jacs.5b02975[11]
017	SI Figure 6	10.1002/smll.201602158[12]
021	Figure 5C	10.1002/celc.201700517[13]
022	Figure 3A, 3C	10.1002/cssc.201600202[14]
023	Figure 4A	10.1021/ja501923g[15]
024	Figure 4B	10.1021/acsenergylett.8b00472[16]
025	SI Figure 12	10.1021/ja4113885[17]
026	Figure 2D	10.1016/j.elecom.2016.05.003[18]
027	Figure 3A, 3C	10.1021/ja2108799[19]
028	Figure 7A	10.1021/acs.jpcc.7b01586[20]
029	SI Figure 13	10.1021/acscatal.7b00707[21]
031	Figure 7	10.1016/j.electacta.2016.03.182[22]

032	Figure 8	10.1016/j.jcou.2017.05.024[23]
033	Figure 2D	10.1002/cssc.201902859[24]
035	Figure 4	10.1021/acsami.8b03461[25]
036	SI Figure 8	10.1021/acsami.7b10421[26]
039	Figure 3A	10.1002/asia.201800946[27]
040	Figure 7	10.1002/cssc.201802409[28]
042	SI Figure 4	10.1021/acsaem.8b00356[29]
043	SI Fiigure 14	10.1021/acs.jpcc.8b06234[30]
045	SI Figure 13	10.1021/acsaem.8b02048[31]
048	Figure 6C	10.1002/celc.201801132[32]
049	Figure 4C	10.1002/adma.201706194[33]
050	Figure 3	10.1038/ncomms4242[34]
051	Figure 4	10.1021/acscatal.5b01235[35]
052	Figure 4E	10.1002/aenm.201701456[36]
053	Figure 3F	10.1016/j.chempr.2017.08.002[37]
054	Figure 4C	10.1002/anie.201608279[38]
055	Figure 7A	10.1016/j.apcatb.2018.01.001[39]
056	Figure 4	10.1021/ja3010978[40]
057	Figure 2C	10.1016/j.apcatb.2018.09.025[41]
058	Figure 5D	10.1021/jacs.6b10435[42]
059	Figure 6	10.1021/jacs.6b12217[43]
060	Figure 2F	10.1002/ange.201805696[44]
061	Figure 6	10.20964/2017.03.72[45]
062	Figure 3B	10.1002/cssc.201702229[46]
063	Figure 3D	10.1002/aenm.201801536[47]
064	Figure 4A	10.1016/j.jcis.2018.09.036[48]
065	Figure 7	10.1016/j.nanoen.2018.03.023[49]

066	Figure 3D	10.1021/jacs.7b12506 [50]
067	Figure 2D	10.1021/acscatal.5b00922 [51]
068	Figure 3F	10.1021/acsnano.7b03029 [52]
069	Figure 4D	10.1021/acscatal.7b03449 [53]
070	Figure 8	10.1016/j.apsusc.2016.10.017 [54]
071	Figure 3	10.1002/anie.201802055 [55]
072	Figure 6A	10.1016/j.electacta.2018.04.047 [56]
074	Figure 2G	10.1021/jacs.5b08212 [57]
076	Figure 3A	10.1002/anie.201809255 [58]
077	Figure 4A	10.1002/anie.201711255 [59]
078	Figure 3G	10.1016/j.nanoen.2018.09.053 [60]
080	Figure 2H	10.1002/anie.201800367 [61]
081	Figure 7	10.1016/j.cej.2016.02.084 [62]
083	Figure 2B	10.1016/j.apcatb.2017.06.032 [63]
084	Figure 2E	10.1016/j.jcat.2018.05.005 [64]
085	Figure 3E	10.1002/anie.201803873 [65]
086	Figure 3C	10.1002/anie.201806043 [66]
087	Figure 4D	10.1016/j.electacta.2018.09.080 [67]
088	Figure 5	10.1023/B:JACH.0000003866.85015.b6 [68]
089	Figure 6	10.1021/jp9822945 [69]
090	Figure 5C	10.1002/smll.201704049 [70]
091	Figure 5D	10.1016/j.nanoen.2016.11.004 [71]
092	Figure 5B	10.1002/anie.201701104 [72]
093	Figure 3A	10.1021/jacs.6b12103 [73]
094	Figure 4A	10.1002/anie.201903613 [74]
095	SI Figure 8C	10.1002/anie.201900499 [8]
096	Figure 2B	10.1002/adfm.201800499 [75]

097	SI Figure 6	10.1016/j.cattod.2015.05.017[76]
098	Figure 4C	10.1021/acsami.7b16164[77]
099	Figure 3	10.1002/smll.201703314[78]
100	Figure 4A	10.1016/j.apcatb.2018.08.075[79]
101	Figure 4D	10.1073/pnas.1711493114[80]
102	Figure 5B	10.1002/cssc.201800925[81]
103	Figure 1C	10.1021/acscatal.5b02424[82]
104	Figure 3F	10.1021/acsenergylett.8b00519[83]
105	Figure 4B	10.1002/anie.201612194[84]
106	Figure 3C	10.1002/anie.201703720[85]
108	SI Figure 4	10.1021/acs.nanolett.5b04123[86]
109	Figure 3F	10.1002/anie.201901575[87]
110	Figure 3D	10.1016/j.electacta.2018.12.116[88]
111	Figure 5A	10.1021/acscatal.8b01022[89]
112	Figure 3	10.1002/cssc.201701673[90]
113	Figure 2D	10.1002/aenm.201900276[91]
114	Fgiure 2D	10.1021/acsenergylett.8b01286[92]
115	Figure 2D	10.1002/anie.201712221[93]
116	Figure 2D	10.1002/anie.201807571[94]
117	Figure 3A	10.1021/acsenergylett.7b01096[95]
118	Figure 5	10.1021/acsaem.8b01692[96]
119	Figure 6	10.1039/C5CP03559G[97]
120	SI Figure 6	10.1126/science.aaw7515[98]
121	Figure 10	10.1002/celc.201801036[99]
122	Figure 5A	10.1002/adma.201705872[100]
123	Figure 4C	10.1021/acscatal.8b04852[101]
124	Figure 2F	10.1016/j.jcou.2019.05.026[102]

125	Figure 3D	10.1002/ange.201810538[103]
126	Figure 3C	10.1016/j.joule.2018.11.008[104]
127	Figure 1D	10.1002/aenm.201700759[105]
128	Figure 5B	10.1002/celc.201700935[106]
129	Figure 4B	10.1016/j.apcatb.2019.03.047[107]
130	SI Figure 5B	10.1002/anie.201911995[108]
131	SI Figure 12	10.1002/aenm.201702524[109]
132	Figure 4C	10.1002/ange.201805256[110]
133	SI Figure 10	10.1002/aenm.201601103[111]
134	Figure 2A	10.1038/s41467-018-07970-9[112]
135	Figure 2B	10.1016/j.nanoen.2019.05.003[113]
136	Figure 4	10.1039/C6TA04325A[114]
137	Figure 2D	10.1002/celc.201800806[115]
138	Figure 3B	10.1002/anie.201805871[116]
139	Figure 4	10.1002/chem.201603359[117]
140	Figure 3D	10.1002/aenm.201903068[118]
141	Figure 3	10.1002/cssc.201501637[119]
142	Figure 3F	10.1002/anie.201907399[120]
143	Figure 3E	10.1016/j.electacta.2018.08.002[121]
144	Figure 4A	10.1021/jp509967m[122]
145	SI Figure 8	10.1021/acs.est.5b00066[123]
146	SI Figure 10	10.1021/acscatal.6b00543[124]
147	SI Figure 39	10.1016/j.joule.2019.05.010[125]
148	Figure 3B	10.1016/j.jcou.2019.02.007[126]
149	Figure 4D	10.1002/cssc.201903117[127]
150	Figure 3C	10.1002/chem.201803615[128]
151	Figure 5D	10.1002/celc.201800104[129]

152	Figure 4A	10.1039/C9EE00018F [130]
153	SI Figure 10	10.1016/j.joule.2018.10.015 [131]
154	Figure 5	10.1002/celc.201900725 [132]
155	Figure 4B	10.1038/ncomms14503 [133]
156	Figure 2D	10.1016/j.elecom.2018.10.014 [134]
157	Figure 2C	10.1002/aenm.201803151 [135]
158	Figure 4E	10.1016/j.elecom.2019.03.017 [136]
159	Figure 4B, 4C	10.1002/cssc.201802725 [137]
160	Figure 12	10.1016/j.matchemphys.2017.02.016 [138]
161	Figure 4	10.1002/adfm.201802339 [139]
162	Figure 4D	10.1016/j.nanoen.2016.06.043 [140]
163	Figure 4C	10.1038/ncomms12697 [141]
164	Figure 4F	10.1021/acssuschemeng.9b03502 [142]
165	Figure 5B	10.1039/C8TA03328E [143]
166	Figure 6C	10.1039/C7TA03005C [144]
167	Figure 3A	10.1002/anie.201908735 [145]
168	Figure 6D	10.1021/acsaem.9b02324 [146]
169	Figure 2C	10.1021/acs.jpcb.9b09730 [147]
170	Figure 3A	10.1073/pnas.1602984113 [148]
171	Figure 2	10.1021/acscatal.8b02181 [149]

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