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Scientific fraud and its implications on electrochemical and corrosion science research

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ABSTRACT

Misconduct in experimental electrochemical and corrosion research does not appear to be on the increase. However, 'gamesmanship' does appear to be becoming more frequent. All of these activities are awful for science because of the impact they have on public trust of science. They are also terrible for people who become involved – the scientist who commits misconduct. We expects ethical behaviour from scientists. Ethics implies being a good person and being good at one's profession. The common view appears to be that the majority of scientists aspire to achieve these high standards. In recent years, issues of academic honesty, including data fabrication and plagiarism, have become hot topics among university faculty. Many universities are trying various tools such as plagiarism-detection software in order to rampant what some describe as an explosion of instances of plagiarism at the university level. A new technique has been suggested in this study that include using digitizing softwares to develop a proposal that involves conducting data audits of submitted manuscripts to prevent publications of fraudulent work. This new tool has been used to investigate an article published in Electrochimica Acta 52 (2007) 3588–3600 which was selected to be a raw model for fabrication of data.

Keywords: Fabrication; Fraud; Scientific Misconduct; Scientific publication

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INTRODUCTION

Scientific research has typically been founded on high ethical standards established by researchers in academia and health care research institutions. Scientific fraud, an act of deception or misrepresentation of one's own work, violates these ethical standards. It can take the form of plagiarism, falsification of data, and irresponsible authorship. Scientific fraud has been attributed to misdirected attempts to attain high levels of personal and professional success. Researchers so prone commit scientific fraud in a search for promotion, status, tenure, and the obtaining of research grants[1].

Scientific research is widely believed to be the pursuit of objective truth with a view to providing benefits for mankind. The pursuit of truth is through the development and testing of hypotheses using reliable methods. In this respect, electrochemistry and corrosion studies are not different, for while their principal aim is to decipher the electrochemical phenomena and their effects, this is done with the purpose of discovering the 'truth' behind these phenomena towards a particular material[2].

Fraud and is not new in science. According to Dworkin [3], historical examples of it can be found in the works of Ptolemy, Newton, Mendel, and Sir Cyril Burt. Ptolemy has been accused of lifting his observations from an earlier

astronomer's work. In his *Principia*, Newton has been accused of making facts fit his theory. Mendel's observations regarding pea plants have been questioned by scientists, because his results were too perfect. Sir Cyril Burt and co-workers were found to have fabricated data, , to support his ideas on the relationship of intelligence to class stratification among British society[1].

There is evidence that scientific fraud is becoming a problem in electrochemical and corrosion research. Scientific fraud can be defined as deliberate or unintentional. If deliberate, it is a conscious act of deception in science. It is the passing off of false information as true and, as such, is a misrepresentation of empirical and/or other evidence[1, 4, 5]. It can take several forms, e.g. plagiarism, falsification of data, fabrication of data, and irresponsible authorship. Plagiarism, known as literature thievery, is the practice of taking others' ideas and writings and passing them off as one's own work. Falsification of data is the process of altering the data to support a specific outcome. Fabrication of data is the making up of data to support a preconceived result. Irresponsible authorship is the process whereby an author submits co-authors as major contributors when they were not, or disregards the recognition of a major contributor [1, 6-8]. Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. In this article we will discuss major investigations of a tragic and stunning case of fabrication results as well as falsification of research materials in electrochemistry using a new tool that we propose to editors to count on in discovering the fraudulent results in the submitted manuscript before passing them to reviewers. As reading of a single scientific manuscript seldom alerts scientists, reviewers, editors, and scientific administrators to the fabrication and falsification of data and information in this manuscript. Journal article titled "The inhibition of low carbon steel corrosion in hydrochloric acid solutions by succinic acid Part I. Weight loss, polarization, EIS, PZC, EDX and SEM studies" cited in Electrochimica Acta 52 (2007) 3588–3600 has been selected to be a raw model for fabrication of data and we will investigate this article by our new tool that conduct a data audits.

MATERIALS AND METHODS

The following software programs have been used in this investigation:
- Origin Pro from Origin Lab version 8, http://www.originlab.com
- SigmaPlot 11.0, from scientific computing world, http://www.sigmaplot.com
- UN-SCAN-IT, Graph Digitizing Software, from http://www.silkscientific.com/

The graph digitizing software has been used to get the data used in graphing all figures in the article. SigmaPlot and Origin have been used to do some calculations and graphical analysis that prove the fabrication of the data

RESULTS AND DISCUSSION

In this article titled "The inhibition of low carbon steel corrosion in hydrochloric acid solutions by succinic acid Part I. Weight loss, polarization, EIS, PZC, EDX and SEM studies" cited in Electrochimica Acta which is The official journal of the International Society of Electrochemistry (ISE) with impact factor 3.832 according to journal citation report , 2011. Authors claimed that they studied the effect of succinic acid (SA) on the corrosion inhibition of a low carbon steel (LCS) electrode in aerated non-stirred 1.0M HCl solutions in the pH range (2–8) at 25 °C using weight loss, potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) techniques. In this section we will investigate some of these experimental tools and by using some graphic techniques available in the software described in the materials and methods section to show the reality of these experimental data.

3.1 Fabricated results of weight loss measurements

Several evidences for the fraud of the data presented in Figure 1[9]. Visual inspection of Figure 1[9] shows that all data is located on the straight lines with zero error percent. It means that all the 160 points of Figure 1[9] are located on the straight line, which is experimentally impossible and has never been happened in all literature except those articles by the same authors[9-21].

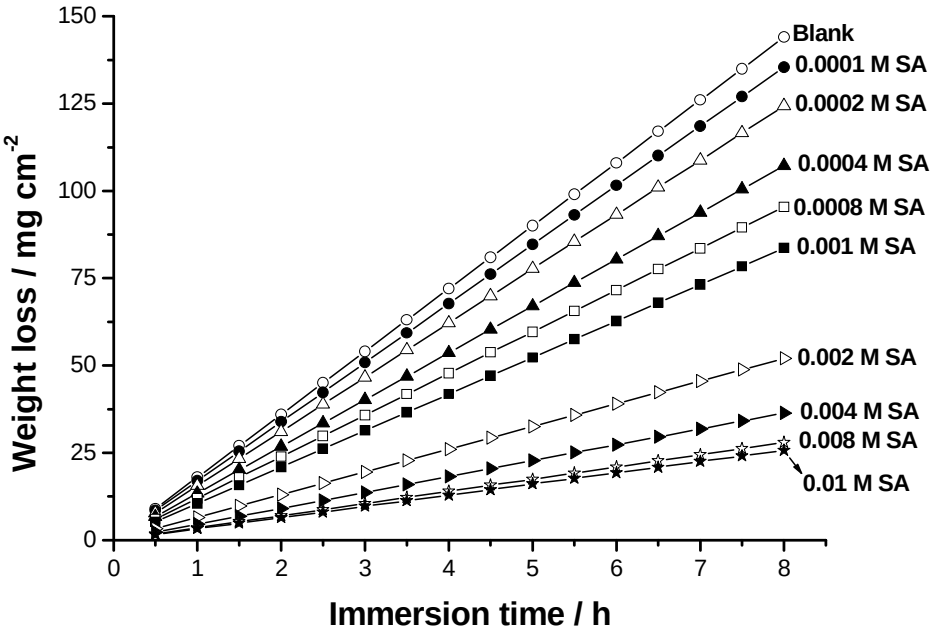

Figure 1- Variation of the weight loss data (in mg cm^{-2}) with the immersion time recorded for a LCS electrode in 1.0 M HCl solutions in the absence and presence of various concentrations of SA at 25^{o}C and at different pH values [9].

Digitizing the curves in Figure 1[9] gives the data in Table 1, inspection of the digitized data in Table 1 shows that Figure 1[9] is completely fake as the authors multiply the column y in Table 1 by a constant value to produce the different curves in Figure 1[9] from curve 1 to 10, these constants can be obtained by dividing each y-axes by another in Figure 1[9], take an example if reader of this manuscript divides B(y)/C(y) tabulated in Table 1, the quotion equals a constant which is 1.0632 for all 16 rows in Table 1, the same way in fabrication of results appeares when we divide B(y)/D(y)=1.1583 again for the all 16 rows in Table 1, another example , B(y)/E(y)=1.3433, and so on. These simple calculations can be made manually using a simple calculator. These constants are calculated by dividing y-columns, and in each case we can get a constant value for all points on the curve, which means that the authors fabricated these data by multiplying the y-axes by these constant values to cheat the reader.

Table 1: Digitized data of Figure 1[9] proof that the data in Figure 1 is completely fake

	A(X)	B(Y)	C(Y)	D(Y)	E(Y)	F(Y)	G(Y)	H(Y)	I(Y)	J(Y)	K(Y)
1	0.5	9	8.465	7.77	6.7	5.965	5.225	3.255	2.275	1.745	1.605
2	1	18	16.93	15.54	13.4	11.93	10.45	6.51	4.55	3.49	3.21
3	1.5	27	25.395	23.31	20.1	17.895	15.675	9.765	6.825	5.235	4.815
4	2	36	33.86	31.08	26.8	23.86	20.9	13.02	9.1	6.98	6.42
5	2.5	45	42.325	38.85	33.5	29.825	26.125	16.275	11.375	8.725	8.025
6	3	54	50.79	46.62	40.2	35.79	31.35	19.53	13.65	10.47	9.63
7	3.5	63	59.255	54.39	46.9	41.755	36.575	22.785	15.925	12.215	11.235
8	4	72	67.72	62.16	53.6	47.72	41.8	26.04	18.2	13.96	12.84
9	4.5	81	76.185	69.93	60.3	53.685	47.025	29.295	20.475	15.705	14.445
10	5	90	84.65	77.7	67	59.65	52.25	32.55	22.75	17.45	16.05
11	5.5	99	93.115	85.47	73.7	65.615	57.475	35.805	25.025	19.195	17.655
12	6	108	101.58	93.24	80.4	71.58	62.7	39.06	27.3	20.94	19.26
13	6.5	117	110.045	101.01	87.1	77.545	67.925	42.315	29.575	22.685	20.865
14	7	126	118.51	108.78	93.8	83.51	73.15	45.57	31.85	24.43	22.47
15	7.5	135	126.975	116.55	100.5	89.475	78.375	48.825	34.125	26.175	24.075
16	8	144	135.44	124.32	107.2	95.44	83.6	52.08	36.4	27.92	25.68
17	--	--	--	--	--	--	--	--	--	--	--

To confirm that the results presented in Figure 1 and Table 1 are fabricated, we plot the digitized data in Table 1 and we got Figure 1' which is exactly the same as Figure 1.

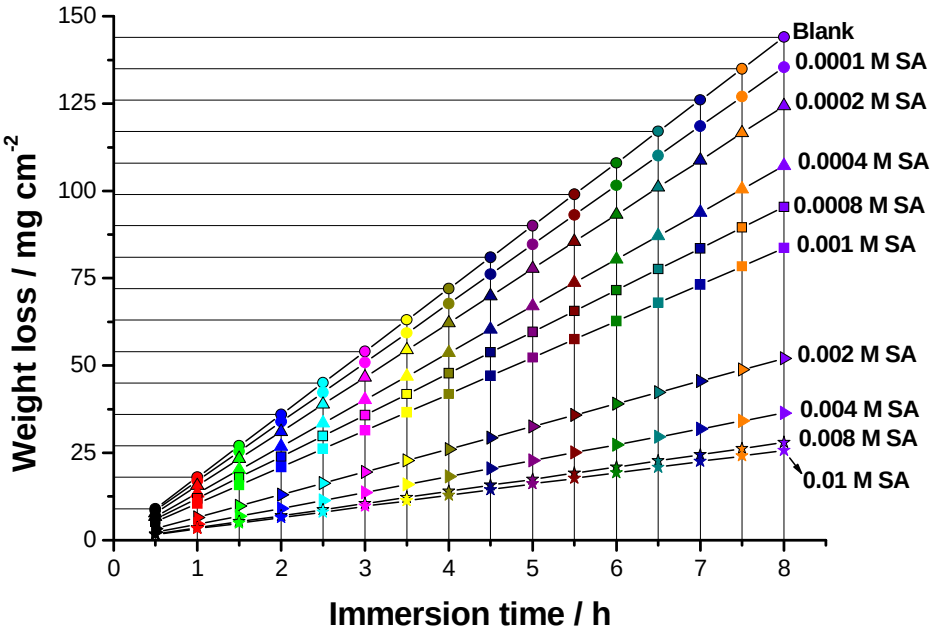

Figure 1': Digitized data in Table 1

The color version of Figure 1', with vertical and horizontal drop lines clearly indicate the fabrication of the weight loss data presented in article [9] and the same fabrication technique has been used in other articles [9-21].

3.2 Fabrication of polarization measurements

An example of polarization of measurements is presented in Figure 7[9]. Investigation of the results presented in Figure 7[9] shows that all of these results are fake and fabricated and this will be supported by evidences as follows:

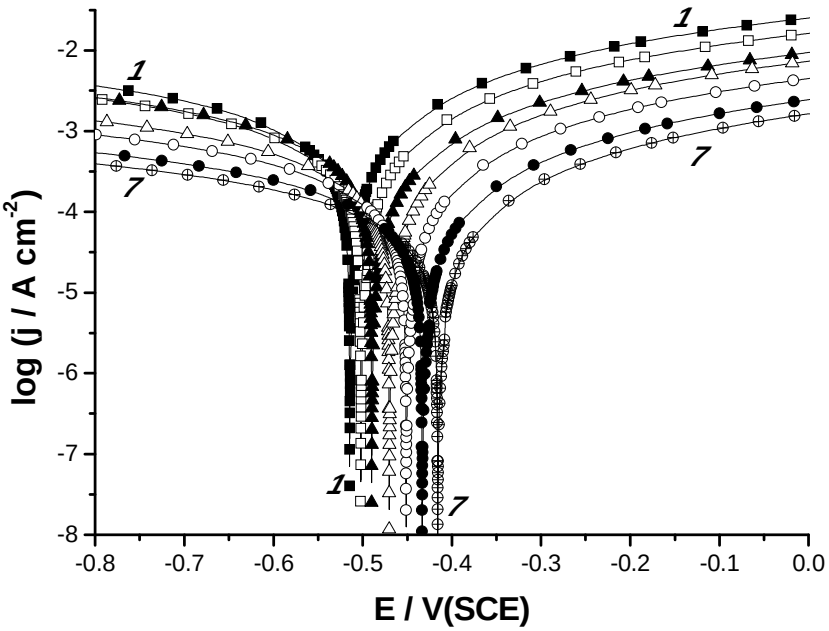

Figure 7- Effect of pH on the potentiodynamic anodic and cathodic polarization characteristics of a LCS electrode in 1.0 M HCl solution containing 0.001 M SA at a scan rate of 0.10 mV s^{-1} and at 25°C. (1) pH 2; (2) pH 3; (3) pH 4; (4) pH 5; (5) pH 6; (6) pH 7; (7) pH 8 [9].

Table 2: digitized data from Figure[9]

	A(X1)	B(Y1)	C(X2)	D(Y2)	E(X3)	F(Y3)	G(X4)	H(Y4)	I(X5)	J(Y5)	K(X6)	L(Y6)	M(X7)	N(Y7)
1	-1.30682	-1.99229	-1.27495	-2.18262	-1.24385	-2.19608	-1.1941	-2.52941	-1.14633	-2.74329	-1.10048	-3.00653	-1.05646	-3.18262
2	-1.25731	-2.02032	-1.22665	-2.21065	-1.19673	-2.22411	-1.14886	-2.55744	-1.10291	-2.77132	-1.05879	-3.03456	-1.01644	-3.21065
3	-1.20782	-2.05028	-1.17836	-2.24061	-1.14962	-2.25407	-1.10364	-2.5874	-1.05949	-2.80128	-1.01711	-3.06452	-0.97643	-3.24061
4	-1.15831	-2.08247	-1.13006	-2.2728	-1.1025	-2.28626	-1.0584	-2.61959	-1.01606	-2.83347	-0.97542	-3.09671	-0.9364	-3.2728
5	-1.10881	-2.11723	-1.08176	-2.30756	-1.05538	-2.32102	-1.01316	-2.65435	-0.97264	-2.86823	-0.93373	-3.13147	-0.89638	-3.30756
6	-1.05931	-2.15502	-1.03348	-2.34535	-1.00827	-2.35881	-0.96794	-2.69214	-0.92922	-2.90602	-0.89205	-3.16926	-0.85637	-3.34535
7	-1.00981	-2.19641	-0.98518	-2.38674	-0.96115	-2.4002	-0.9227	-2.73353	-0.8858	-2.94741	-0.85036	-3.21065	-0.81635	-3.38674
8	-0.96031	-2.24217	-0.93689	-2.4325	-0.91404	-2.44596	-0.87748	-2.77929	-0.84238	-2.99317	-0.80868	-3.25641	-0.77634	-3.4325
9	-0.91081	-2.29332	-0.88859	-2.48365	-0.86692	-2.49711	-0.83224	-2.83044	-0.79895	-3.04432	-0.767	-3.30756	-0.73632	-3.48365
10	-0.86131	-2.35131	-0.84031	-2.54164	-0.81981	-2.5551	-0.78702	-2.88843	-0.75554	-3.10231	-0.72532	-3.36555	-0.6963	-3.54164
11	-0.81181	-2.41826	-0.79201	-2.60859	-0.77269	-2.62205	-0.74178	-2.95538	-0.71211	-3.16926	-0.68363	-3.4325	-0.65628	-3.60859
12	-0.76231	-2.49744	-0.74372	-2.68777	-0.72558	-2.70123	-0.69656	-3.03456	-0.66869	-3.24844	-0.64195	-3.51168	-0.61627	-3.68777
13	-0.71281	-2.59435	-0.69542	-2.78468	-0.67846	-2.79814	-0.65132	-3.13147	-0.62527	-3.34535	-0.60026	-3.60859	-0.57625	-3.78468
14	-0.66331	-2.71929	-0.64713	-2.90962	-0.63135	-2.92308	-0.6061	-3.25641	-0.58185	-3.47029	-0.55858	-3.73353	-0.53623	-3.90962
15	-0.61381	-2.89538	-0.59884	-3.08571	-0.58423	-3.09917	-0.56086	-3.4325	-0.53843	-3.64638	-0.51689	-3.90962	-0.49621	-4.08571
16	-0.56431	-3.19641	-0.55055	-3.38674	-0.53712	-3.4002	-0.51564	-3.73353	-0.49501	-3.94741	-0.47521	-4.21065	-0.4562	-4.38674
17	-0.55935	-3.24217	-0.54571	-3.4325	-0.5324	-3.44596	-0.5111	-3.77929	-0.49066	-3.99317	-0.47103	-4.25641	-0.45219	-4.4325
18	-0.5544	-3.29332	-0.54088	-3.48365	-0.52769	-3.49711	-0.50658	-3.83044	-0.48632	-4.04432	-0.46687	-4.30756	-0.44819	-4.48365
19	-0.54946	-3.35131	-0.53605	-3.54164	-0.52298	-3.5551	-0.50206	-3.88843	-0.48198	-4.10231	-0.4627	-4.36555	-0.44419	-4.54164
20	-0.54451	-3.41826	-0.53123	-3.60859	-0.51827	-3.62205	-0.49754	-3.95538	-0.47764	-4.16926	-0.45853	-4.4325	-0.44019	-4.60859
21	-0.53956	-3.49744	-0.5264	-3.68777	-0.51356	-3.70123	-0.49302	-4.03456	-0.4733	-4.24844	-0.45437	-4.51168	-0.43619	-4.68777
22	-0.53461	-3.59435	-0.52157	-3.78468	-0.50885	-3.79814	-0.4885	-4.13147	-0.46896	-4.34535	-0.4502	-4.60859	-0.43219	-4.78468
23	-0.53361	-3.61663	-0.5206	-3.80696	-0.5079	-3.82042	-0.48758	-4.15375	-0.46808	-4.36763	-0.44936	-4.63087	-0.43138	-4.80696
24	-0.53262	-3.64011	-0.51963	-3.83044	-0.50696	-3.8439	-0.48668	-4.17723	-0.46721	-4.39111	-0.44853	-4.65435	-0.43058	-4.83044
25	-0.53164	-3.66493	-0.51867	-3.85526	-0.50602	-3.86872	-0.48578	-4.20205	-0.46635	-4.41593	-0.44769	-4.67917	-0.42979	-4.85526
26	-0.53065	-3.69126	-0.51771	-3.88159	-0.50508	-3.89505	-0.48488	-4.22838	-0.46548	-4.44226	-0.44686	-4.7055	-0.42899	-4.88159
27	-0.52965	-3.71929	-0.51673	-3.90962	-0.50413	-3.92308	-0.48396	-4.25641	-0.46461	-4.47029	-0.44602	-4.73353	-0.42818	-4.90962
28	-0.52866	-3.74925	-0.51577	-3.93958	-0.50319	-3.95304	-0.48306	-4.28637	-0.46374	-4.50025	-0.44519	-4.76349	-0.42738	-4.93958
29	-0.52768	-3.78144	-0.51481	-3.97177	-0.50225	-3.98523	-0.48216	-4.31856	-0.46287	-4.53244	-0.44436	-4.79568	-0.42658	-4.97177
30	-0.52669	-3.8162	-0.51384	-4.00653	-0.50131	-4.01999	-0.48126	-4.35332	-0.46201	-4.5672	-0.44353	-4.83044	-0.42579	-5.00653
31	-0.5257	-3.85399	-0.51288	-4.04432	-0.50037	-4.05778	-0.48036	-4.39111	-0.46114	-4.60499	-0.4427	-4.86823	-0.42499	-5.04432
32	-0.5247	-3.89538	-0.51191	-4.08571	-0.49942	-4.09917	-0.47944	-4.4325	-0.46027	-4.64638	-0.44185	-4.90962	-0.42418	-5.08571
33	-0.52372	-3.94114	-0.51094	-4.13147	-0.49848	-4.14493	-0.47854	-4.47826	-0.4594	-4.69214	-0.44102	-4.95538	-0.42338	-5.13147
34	-0.52273	-3.99229	-0.50998	-4.18262	-0.49754	-4.19608	-0.47764	-4.52941	-0.45853	-4.74329	-0.44019	-5.00653	-0.42258	-5.18262
35	-0.52174	-4.05028	-0.50902	-4.24061	-0.4966	-4.25407	-0.47674	-4.5874	-0.45767	-4.80128	-0.43936	-5.06452	-0.42179	-5.24061
36	-0.52074	-4.11723	-0.50804	-4.30756	-0.49565	-4.32102	-0.47582	-4.65435	-0.45679	-4.86823	-0.43852	-5.13147	-0.42098	-5.30756
37	-0.51975	-4.19641	-0.50708	-4.38674	-0.49471	-4.4002	-0.47492	-4.73353	-0.45592	-4.94741	-0.43769	-5.21065	-0.42018	-5.38674
38	-0.51877	-4.29332	-0.50611	-4.48365	-0.49377	-4.49711	-0.47402	-4.83044	-0.45506	-5.04432	-0.43686	-5.30756	-0.41938	-5.48365
39	-0.51778	-4.41826	-0.50515	-4.60859	-0.49283	-4.62205	-0.47312	-4.95538	-0.45419	-5.16926	-0.43602	-5.4325	-0.41858	-5.60859
40	-0.51678	-4.59435	-0.50418	-4.78468	-0.49188	-4.79814	-0.4722	-5.13147	-0.45332	-5.34535	-0.43518	-5.60859	-0.41778	-5.78468
41	-0.51579	-4.89538	-0.50321	-5.08571	-0.49094	-5.09917	-0.4713	-5.4325	-0.45245	-5.64638	-0.43435	-5.90962	-0.41698	-6.08571
42	-0.5157	-4.94114	-0.50312	-5.13147	-0.49085	-5.14493	-0.47122	-5.47826	-0.45237	-5.69214	-0.43427	-5.95538	-0.4169	-6.13147
43	-0.51559	-4.99229	-0.50302	-5.18262	-0.49075	-5.19608	-0.47112	-5.52941	-0.45228	-5.74329	-0.43418	-6.00653	-0.41682	-6.18262
44	-0.5155	-5.05028	-0.50293	-5.24061	-0.49066	-5.25407	-0.47103	-5.5874	-0.45219	-5.80128	-0.4341	-6.06452	-0.41674	-6.24061
45	-0.51541	-5.11723	-0.50283	-5.30756	-0.49057	-5.32102	-0.47095	-5.65435	-0.45211	-5.86823	-0.43402	-6.13147	-0.41666	-6.30756
46	-0.5153	-5.19641	-0.50273	-5.38674	-0.49047	-5.4002	-0.47085	-5.73353	-0.45202	-5.94741	-0.43394	-6.21065	-0.41658	-6.38674
47	-0.51521	-5.29332	-0.50264	-5.48365	-0.49038	-5.49711	-0.47076	-5.83044	-0.45193	-6.04432	-0.43386	-6.30756	-0.4165	-6.48365
48	-0.5151	-5.41826	-0.50254	-5.60859	-0.49028	-5.62205	-0.47067	-5.95538	-0.45184	-6.16926	-0.43377	-6.4325	-0.41642	-6.60859
49	-0.51501	-5.59435	-0.50244	-5.78468	-0.49019	-5.79814	-0.47058	-6.13147	-0.45176	-6.34535	-0.43369	-6.60859	-0.41634	-6.78468
50	-0.5149	-5.89538	-0.50234	-6.08571	-0.49009	-6.09917	-0.47049	-6.4325	-0.45167	-6.64638	-0.4336	-6.90962	-0.41626	-7.08571
51	-0.51481	–	-0.50225	–	-0.49	–	-0.4704	–	-0.45158	–	-0.43352	–	-0.41618	–
52	-0.51471	-7.39538	-0.50216	-7.58571	-0.48991	-7.59917	-0.47031	-7.9325	-0.4515	-8.14638	-0.43344	-8.40962	-0.4161	-8.58571
53	-0.51461	-6.94384	-0.50206	-7.13417	-0.48981	-7.14763	-0.47022	-7.48096	-0.45141	-7.69484	-0.43335	-7.95808	-0.41602	-8.13417
54	-0.51451	-6.6797	-0.50196	-6.87003	-0.48972	-6.88349	-0.47013	-7.21682	-0.45133	-7.4307	-0.43327	-7.69394	-0.41594	-7.87003
55	-0.51441	-6.49229	-0.50186	-6.68262	-0.48962	-6.69608	-0.47004	-7.02941	-0.45123	-7.24329	-0.43318	-7.50653	-0.41586	-7.68262
56	-0.51431	-6.34692	-0.50177	-6.53725	-0.48953	-6.55071	-0.46995	-6.88404	-0.45115	-7.09792	-0.4331	-7.36116	-0.41578	-7.53725
57	-0.51421	-6.22815	-0.50167	-6.41848	-0.48943	-6.43194	-0.46985	-6.76527	-0.45106	-6.97915	-0.43302	-7.24239	-0.4157	-7.41848
58	-0.51411	-6.12773	-0.50157	-6.31806	-0.48934	-6.33152	-0.46977	-6.66485	-0.45098	-6.87873	-0.43294	-7.14197	-0.41562	-7.31806
59	-0.51402	-6.04075	-0.50148	-6.23108	-0.48925	-6.24454	-0.46968	-6.57787	-0.45089	-6.79175	-0.43286	-7.05499	-0.41554	-7.23108
60	-0.51391	-5.96402	-0.50138	-6.15435	-0.48915	-6.16781	-0.46958	-6.50114	-0.4508	-6.71502	-0.43277	-6.97826	-0.41546	-7.15435
61	-0.51382	-5.89538	-0.50129	-6.08571	-0.48906	-6.09917	-0.4695	-6.4325	-0.45072	-6.64638	-0.43269	-6.90962	-0.41538	-7.08571
62	-0.51283	-5.44384	-0.50032	-5.63417	-0.48812	-5.64763	-0.4686	-5.98096	-0.44985	-6.19484	-0.43186	-6.45808	-0.41458	-6.63417
63	-0.51183	-5.1797	-0.49935	-5.37003	-0.48717	-5.38349	-0.46768	-5.71682	-0.44898	-5.9307	-0.43102	-6.19394	-0.41378	-6.37003
64	-0.51085	-4.99229	-0.49839	-5.18262	-0.48623	-5.19608	-0.46678	-5.52941	-0.44811	-5.74329	-0.43019	-6.00653	-0.41298	-6.18262
65	-0.50986	-4.84692	-0.49742	-5.03725	-0.48529	-5.05071	-0.46588	-5.38404	-0.44724	-5.59792	-0.42935	-5.86116	-0.41218	-6.03725
66	-0.50887	-4.72815	-0.49646	-4.91848	-0.48435	-4.93194	-0.46498	-5.26527	-0.44638	-5.47915	-0.42852	-5.74239	-0.41138	-5.91848
67	-0.50787	-4.62773	-0.49548	-4.81806	-0.4834	-4.83152	-0.46406	-5.16485	-0.4455	-5.37873	-0.42768	-5.64197	-0.41057	-5.81806
68	-0.50688	-4.54075	-0.49452	-4.73108	-0.48246	-4.74454	-0.46316	-5.07787	-0.44464	-5.29175	-0.42685	-5.55499	-0.40978	-5.73108
69	-0.5059	-4.46402	-0.49356	-4.65435	-0.48152	-4.66781	-0.46226	-5.00114	-0.44377	-5.21502	-0.42602	-5.47826	-0.40898	-5.65435
70	-0.50491	-4.39538	-0.49259	-4.58571	-0.48058	-4.59917	-0.46136	-4.9325	-0.4429	-5.14638	-0.42519	-5.40962	-0.40818	-5.58571
71	-0.50391	-4.1083	-0.49162	-4.29863	-0.47963	-4.53708	-0.46044	-4.64542	-0.44203	-4.8593	-0.42435	-5.12254	-0.40737	-5.29863
72	-0.50292	-4.05162	-0.49066	-4.24195	-0.47869	-4.4804	-0.45954	-4.58874	-0.44116	-4.80262	-0.42351	-5.06586	-0.40657	-5.24195
73	-0.50194	-3.99947	-0.48969	-4.1898	-0.47775	-4.42825	-0.45864	-4.53659	-0.44029	-4.75047	-0.42268	-5.01371	-0.40578	-5.1898
74	-0.50095	-3.9512	-0.48873	-4.14153	-0.47681	-4.37998	-0.45774	-4.48832	-0.43943	-4.7022	-0.42185	-4.96544	-0.40498	-5.14153
75	-0.49996	-3.90625	-0.48777	-4.09658	-0.47587	-4.33503	-0.45684	-4.44337	-0.43856	-4.65725	-0.42102	-4.92049	-0.40418	-5.09658
76	-0.49896	-3.86421	-0.48679	-4.05454	-0.47492	-4.29299	-0.45592	-4.40133	-0.43769	-4.61521	-0.42018	-4.87845	-0.40337	-5.05454
77	-0.49798	-3.82472	-0.48583	-4.01505	-0.47398	-4.2535	-0.45502	-4.36184	-0.43682	-4.57572	-0.41935	-4.83896	-0.40257	-5.01505
78	-0.49699	-3.78748	-0.48487	-3.97781	-0.47304	-4.21626	-0.45412	-4.3246	-0.43595	-4.53848	-0.41852	-4.80172	-0.40177	-4.97781
79	-0.496	-3.75226	-0.4839	-3.94259	-0.4721	-4.18104	-0.45322	-4.28938	-0.43509	-4.50326	-0.41768	-4.7665	-0.40098	-4.94259
80	-0.495	-3.71885	-0.48293	-3.90918	-0.47115	-4.14763	-0.4523	-4.25597	-0.43421	-4.46985	-0.41684	-4.73309	-0.40017	-4.90918
81	-0.49005	-3.57348	-0.4781	-3.76381	-0.46644	-4.00226	-0.44778	-4.1106	-0.42987	-4.32448	-0.41268	-4.58772	-0.39617	-4.76381
82	-0.48511	-3.45471	-0.47327	-3.64504	-0.46173	-3.88349	-0.44326	-3.99183	-0.42553	-4.20571	-0.40851	-4.46895	-0.39217	-4.64504
83	-0.48016	-3.35429	-0.46845	-3.54462	-0.45702	-3.78307	-0.43874	-3.89141	-0.42119	-4.10529	-0.40434	-4.36853	-0.38817	-4.54462
84	-0.47521	-3.2673	-0.46362	-3.45763	-0.45231	-3.69608	-0.43422	-3.80442	-0.41685	-4.0183	-0.40017	-4.28154	-0.38417	-4.45763
85	-0.47026	-3.19057	-0.45879	-3.3809	-0.4476	-3.61935	-0.4297	-3.72769	-0.41251	-3.94157	-0.39601	-4.20481	-0.38017	-4.3809
86	-0.4653	-3.12193	-0.45395	-3.31226	-0.44288	-3.55071	-0.42516	-3.65905	-0.40816	-3.87293	-0.39183	-4.13617	-0.37616	-4.31226
87	-0.41581	-2.67039	-0.40566	-2.86072	-0.39577	-3.09917	-0.37994	-3.20751	-0.36474	-3.42139	-0.35015	-3.68463	-0.33615	-3.86072
88	-0.3663	-2.40625	-0.35737	-2.59658	-0.34865	-2.83503	-0.3347	-2.94337	-0.32132	-3.15725	-0.30846	-3.42049	-0.29612	-3.59658
89	-0.31681	-2.21885	-0.30908	-2.40918	-0.30154	-2.64763	-0.28948	-2.75597	-0.2779	-2.96985	-0.26678	-3.23309	-0.25611	-3.40918
90	-0.2673	-2.07348	-0.26078	-2.26381	-0.25442	-2.50226	-0.24424	-2.6106	-0.23447	-2.82448	-0.22509	-3.08772	-0.21609	-3.26381
91	-0.21781	-1.95471	-0.21249	-2.14504	-0.20731	-2.38349	-0.19902	-2.49183	-0.19106	-2.70571	-0.18341	-2.96895	-0.17608	-3.14504
92	-0.1881	-1.89262	-0.18352	-2.08295	-0.17904	-2.3214	-0.17188	-2.42974	-0.165	-2.64362	-0.1584	-2.90686	-0.15207	-3.08295
93	-0.1188	-1.7673	-0.11591	-1.95763	-0.11308	-2.19608	-0.10856	-2.30442	-0.10421	-2.5183	-0.10005	-2.78154	-0.09604	-2.95763
94	-0.0693	-1.69057	-0.06761	-1.8809	-0.06596	-2.11935	-0.06332	-2.22769	-0.06079	-2.44157	-0.05836	-2.70481	-0.05602	-2.8809
95	-0.0198	-1.62193	-0.01932	-1.81226	-0.01885	-2.05071	-0.0181	-2.15905	-0.01737	-2.37293	-0.01668	-2.63617	-0.01601	-2.81226
96	0.0297	-1.55985	0.02898	-1.75018	0.02827	-1.98863	0.02714	-2.09697	0.02605	-2.31085	0.02501	-2.57409	0.02401	-2.75018
97	0.0792	-1.50316	0.07726	-1.69349	0.07538	-1.93194	0.07236	-2.04028	0.06947	-2.25416	0.06669	-2.5174	0.06402	-2.69349
98	0.1287	-1.45102	0.12556	-1.64135	0.1225	-1.8798	0.1176	-1.98814	0.1129	-2.20202	0.10838	-2.46526	0.10404	-2.64135
99	0.17821	-1.40274	0.17386	-1.59307	0.16962	-1.83152	0.16284	-1.93986	0.15632	-2.15374	0.15007	-2.41698	0.14407	-2.59307
100	0.2277	-1.3578	0.22215	-1.54813	0.21673	-1.78658	0.20806	-1.89492	0.19974	-2.1088	0.19175	-2.37204	0.18408	-2.54813
101	0.27721	-1.31576	0.27045	-1.50609	0.26385	-1.74454	0.2533	-1.85288	0.24316	-2.06676	0.23344	-2.33	0.2241	-2.50609

Figure 7 in the article[9] gives a clear cut evidence on the fraud committed in this article. As can be seen in Fig. 7 that the curves are identical with little shift to right or left that is too good to be experimental data, to confirm that

these results are fabricated and never been experimentally obtained, Fig. 7 was digitized by a computer software to get data in Table 2. By simple calulator, inspection of the digitized data in Table 2 shows that Figure 7[9] was fabricated by manipulation the x-y data of one curve and multiplying those x-y axes in a constant value. These constants are as follow: A(X1)/C(X2)=1.0250 for all the 101 point in the curve (the same value!!!!!), the same fabricated data can be confirmed from the constant values of A(X1)/E(X3)=1.0506, A(X1)/G(X4)=1.0944, and so on. These constants are calculated by dividing x-axes columns and in each case we can get a constant value for all points on the curve (101 points!!).

Another clear evidence to confirm that the results presented in Table 2 are fake, we graphed the digitized data in Table 2 and we got Figure 2' which is exactly the same as Figure 7[9]. The colour version (available online) shows clearly the fabrication of the polarization data.

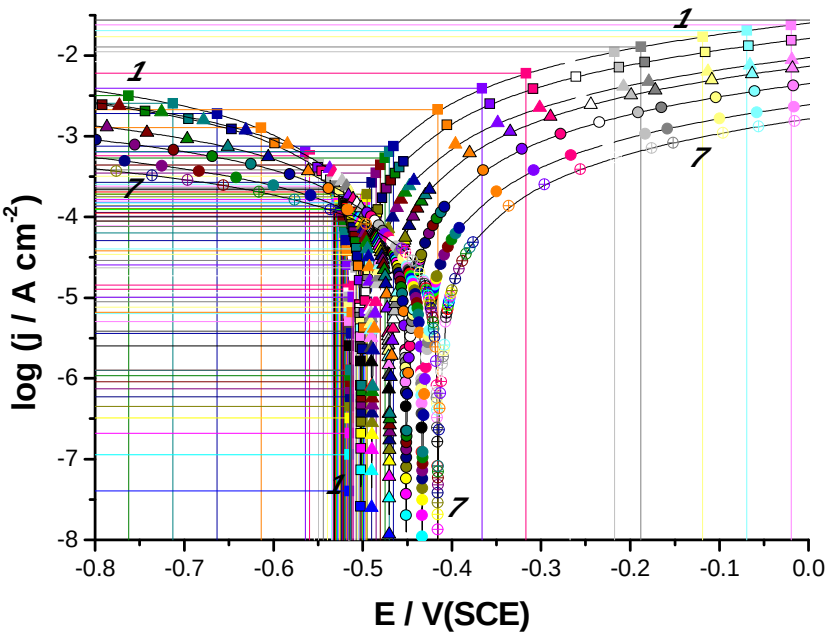

Figure 2': Digitized data presented in Table 2 shows data points on the curve (online color version).

The shifts in the vertical drop lines represent the x- factors that have been used in fabricating the polarization data, and the shift in the horizontal drop lines represents the y-factors that have been used in fabricating the polarization data.

3.3 Fabricating the electrochemical impedance measurements

Authors in reference [9] claimed that they perform electrochemical impedance spectroscopy measurements and their experimental results are presented in Figure 9[9] which represents Nyquist plots recorded for LCS in 1.0 M HCl, Digitizing Figure 9[9] shows the same behaviour described in the previous examples (digitizing data not mentioned here to avoid repetition). Inspection of Figure 9[9] shows an extraordinary similarity for curves in side Figure 9. The inductive loop described in Figure 9 never happened for LCS in 1.0 M HCl.

Because the examination of a single scientific manuscript seldom alerts scientists, reviewers, editors, and scientific administrators to the fabrication and falsification of data and information. Fabrication, in the context presented here was away from investigation along more than a decade due to the absence of effective regulations to govern and manage scientific fraud. Given the tight-knit nature of many academic communities, and the high stakes involved, researchers who are found to have committed fabrication are often effectively (and permanently) blacklisted[22], with reputable research organizations and universities refusing to hire them; funding sources refusing to sponsor them or their work, and journals refusing to consider any of their articles for publication[22].

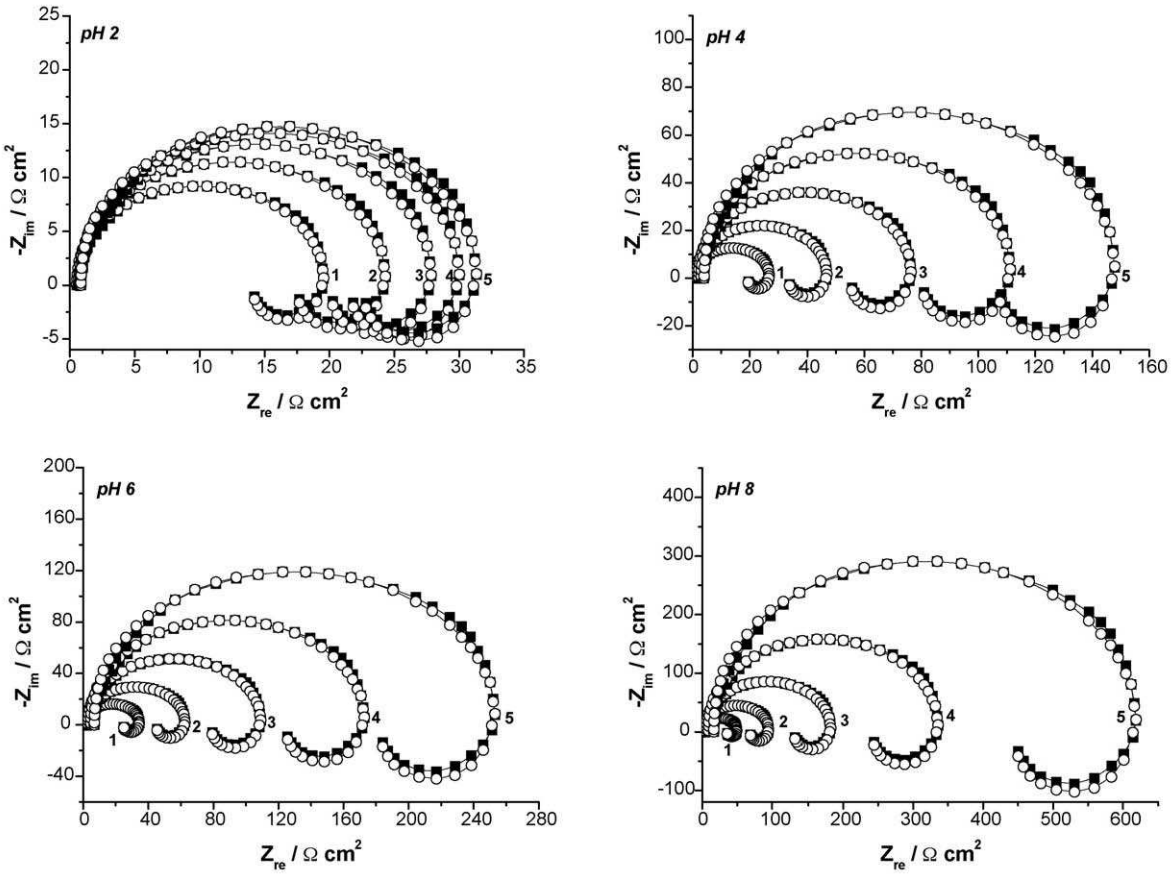

Figure 9- Complex plane impedance plots of a LCS electrode in 1.0 M HCl solutions 25°C without and with different concentrations of SA at the respective corrosion potentials and at different pH values[9].

CONCLUSION

Having given a detailed account of this fraud case, we recommend that editors of scientific journals should get figures not only as images but also as x-y data. Also, rejection as well as retraction of these fraud articles should be made without hesitation in order to keep the reputation of the journal. Digitizing the graphics in the submitted manuscripts prior to send them out for review is a new tool that can minimize the fraudulent practice. This article is showing the fraudulent activities appeared in articles published in highly reputable specialized journals to encourage the scientific community to develop guidelines that prescribe professional conduct in the routine developing and publishing of scientific works. More research should be conducted to facilitate the screening tools available for the journal editors to avoid the appearance of falsified data in the literature.

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