

A P P E N D I X

TABLE 13

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10, 20 and 40% AN, 0.032 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)			
	5% AN	10% AN	20% AN	40% AN
1	-	0.00048	0.00098	0.0014
15	0.0067	0.0098	0.013	0.014
30	0.014	0.019	0.021	0.023
45	0.022	0.027	0.033	0.034
60	0.030	0.034	0.035	0.036
75	0.033	0.036	0.039	0.041
90	0.040	0.040	0.044	0.045
105	0.044	0.046	0.050	0.052
120	0.051	0.053	0.053	0.054
135	0.053	0.060	-	0.060
150	0.061	-	-	-
165	-	0.062	0.062	-
180	-	0.064	0.064	0.064
195	-	-	-	0.064

TABLE 14

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10, 20 and 40% AN, 0.032 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)			
	5% AN	10% AN	20% AN	40% AN
1	0.0014	0.0016	0.0095	0.0095
5	0.0052	0.0090	0.012	0.013
10	0.014	0.019	0.019	0.028
15	0.022	0.027	0.031	0.037
20	0.030	0.035	0.038	0.044
25	0.037	0.042	0.043	0.049
30	0.042	0.048	0.047	0.054
35	0.047	0.053	0.054	0.057
40	0.052	0.057	0.058	0.060
45	0.056	0.060	0.060	0.061
50	0.060	-	0.060	0.063
55	-	-	0.062	0.064
60	-	-	0.063	-

TABLE 15

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10, 20 and 40% AN, 0.032 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)			
	5% AN	10% AN	20% AN	40% AN
1	0.00095	0.0012	0.0019	0.0019
5	0.010	0.016	0.020	0.025
10	0.021	0.029	0.033	0.040
15	0.032	0.038	0.043	0.051
20	0.039	0.045	0.051	0.057
25	0.047	0.050	0.056	0.061
30	0.053	0.055	0.059	0.064
35	0.059	0.061	0.061	-
40	0.061	0.061	0.062	-
45	0.064	-	0.063	-
50	-	-	0.064	-

TABLE 16

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10, 20 and 40% AN, 0.064 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)			
	5% AN	10% AN	20% AN	40% AN
1	0.0011	0.0033	0.0036	0.0040
15	0.0131	0.017	0.035	0.054
30	0.020	0.030	0.058	0.077
45	0.029	0.037	0.072	0.093
60	0.038	0.051	0.082	0.104
75	0.045	0.059	0.101	0.111
90	0.049	0.067	0.104	0.117
105	0.055	0.077	0.111	0.126
120	0.065	0.084	0.119	-
135	-	0.089	0.123	-
150	0.070	0.097	0.127	-
165	0.075	0.099	-	-
180	0.079	-	-	-
195	-	-	-	-
210	-	-	-	-
225	0.085	-	-	-
240	0.087	-	-	-
255	0.091	-	-	-

TABLE 17

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10, 20 and 40% AN, 0.064 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)			
	5% AN	10% AN	20% AN	40% AN
1	0.0023	0.0028	0.0060	0.010
5	0.026	0.029	0.050	0.059
10	0.040	0.046	0.076	0.078
15	0.053	0.061	0.090	0.093
20	0.067	0.075	0.105	0.110
25	0.082	0.085	0.114	0.121
30	0.083	0.091	0.122	-
35	0.090	0.097	0.127	-
40	0.092	0.106	-	-
45	0.095	0.109	-	-
50	-	0.114	-	-
55	-	0.118	-	-
60	0.113	0.125	-	-
65	-	0.128	-	-
70	-	-	-	-
75	0.119	-	-	-

TABLE 18

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10, 20 and 40% AN, 0.064 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)			
	5% AN	10% AN	20% AN	40% AN
1	0.0033	0.0034	0.012	0.013
5	0.026	0.036	0.066	0.067
10	0.052	0.072	0.099	0.116
15	0.074	0.084	0.114	0.126
20	0.084	0.099	0.125	0.128
25	0.095	0.107	0.128	-
30	0.102	0.115	0.128	-
35	0.105	0.120	0.128	-
40	0.110	0.128	0.128	-
45	0.114	0.128	0.128	-
50	0.119	-	0.128	-
55	0.123	-	-	-
60	0.128	-	-	-

TABLE 19

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.16 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	0.00095	0.0029	0.0036
15	0.033	0.042	0.054
30	0.053	0.058	0.098
45	0.071	0.095	0.125
60	0.084	0.120	0.140
75	0.089	0.131	0.152
90	0.095	0.136	0.157
105	0.104	0.149	0.169
120	0.111	0.151	0.173
135	0.111	0.153	-
150	-	0.153	0.176
165	-	-	-
180	-	0.155	0.178

TABLE 20

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.16 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	0.0029	0.0069	0.0086
5	0.042	0.060	0.064
10	0.072	0.100	0.104
15	0.105	0.123	0.142
20	0.121	0.153	0.169
25	0.134	0.173	0.193
30	0.146	0.195	0.212
35	0.155	0.203	0.229
40	0.161	0.218	0.248
45	0.171	0.227	0.266
50	0.178	0.237	0.275
55	0.180	0.250	0.285
60	0.186	0.258	0.294
65	-	-	0.302
70	0.186	-	0.307
75	-	0.269	0.309
80	-	0.273	-
85	-	0.280	-
90	-	0.284	-
95	-	0.287	-
100	-	0.294	-
105	-	0.294	-
110	-	0.294	-

TABLE 21

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.16 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	0.0029	0.0048	0.0078
5	0.042	0.060	0.083
10	0.107	0.130	0.155
15	0.121	0.176	0.199
20	0.152	0.207	0.230
25	0.169	0.214	0.249
30	0.183	0.229	0.261
35	-	0.248	0.273
40	0.191	0.252	0.276
45	0.193	0.256	0.282
50	0.199	0.261	0.290
55	0.205	0.268	0.292
60	-	0.273	0.298
65	0.205	0.277	0.302
70	0.209	0.281	0.304
75	0.210	0.285	0.311
80	-	0.291	0.311
85	-	0.296	0.313
90	0.210	0.299	0.313
95	0.212	0.302	-
100	-	0.306	-
105	0.216	-	-
110	0.216	-	-

TABLE 22

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	-	-	0.0028
15	0.031	0.063	0.090
30	0.063	0.108	0.143
45	0.082	0.120	0.167
60	0.096	0.142	0.167
75	0.101	0.159	0.183
90	0.108	0.166	0.183
105	0.111	0.168	0.185
120	0.118	0.176	-
135	-	0.178	-
150	-	0.183	-
165	0.120	-	-
180	0.125	-	-
195	0.130	0.183	-
210	-	0.183	-
225	0.130	-	-

TABLE 23

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	-	0.0048	0.0071
5	0.048	0.096	0.098
10	0.089	0.159	0.183
15	0.113	0.204	0.238
20	0.137	0.243	0.286
25	0.156	0.269	0.333
30	0.168	0.286	0.357
35	0.171	0.305	0.388
40	0.185	0.315	0.405
45	0.197	0.334	0.426
50	0.202	0.344	0.440
55	0.207	0.356	0.457
60	0.209	0.361	0.464
65	0.214	0.368	0.476
70	0.214	0.373	0.483
75	0.214	0.375	0.488
80	0.214	0.382	0.502
85	-	0.382	0.505
90	-	0.387	0.517
95	-	0.387	0.517
100	-	0.387	0.526
105	-	0.387	0.536
110	-	-	0.538
115	-	-	0.550
120	-	-	0.555

TABLE 24

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	0.0024	0.0048	0.024
5	0.072	0.094	0.181
10	0.127	0.165	0.302
15	0.161	0.243	0.379
20	0.185	0.296	0.421
25	0.202	0.337	0.450
30	0.212	0.363	0.474
35	0.224	0.377	0.493
40	0.226	0.394	0.517
45	0.236	0.406	0.521
50	0.238	0.413	0.540
55	0.240	0.418	0.540
60	0.240	0.426	0.545
65	0.240	0.426	0.557
70	0.240	0.430	0.564
75	-	0.435	0.574
80	-	0.435	-
85	-	-	0.574
90	-	-	0.583
95	-	-	-
100	-	-	0.588
105	-	-	0.593
110	-	-	0.598
115	-	-	0.602
120	-	-	0.602

TABLE 25

Effect of H_2SO_4 on the amount of copper(I) formed (M) as a function of time in H_2O + AN mixtures containing 5% AN, $0.064 \text{ mol dm}^{-3}$ copper sulphate and 4 g copper crystals ($2-30 \mu\text{m}$) in 150 cm^3 of the reaction solution at 25°C .

Time in minutes	M (mol dm^{-3})			
	0.07 H_2SO_4 (mol dm^{-3})	0.18 H_2SO_4 (mol dm^{-3})	0.28 H_2SO_4 (mol dm^{-3})	0.47 H_2SO_4 (mol dm^{-3})
1	0.0023	0.0024	0.0039	0.0035
5	0.026	0.028	0.030	0.031
10	0.040	0.040	0.058	0.047
15	0.053	0.054	0.068	0.065
20	0.067	0.068	0.084	-
25	0.082	0.083	0.086	0.084
30	0.083	0.085	0.094	0.093
35	0.090	0.093	0.096	0.097
40	0.092	0.095	0.109	0.097
45	0.095	0.098	0.113	0.099
50	-	-	0.117	0.105
55	-	-	-	0.117
60	0.113	0.121	-	-
65	-	-	-	-
70	-	-	-	-
75	0.119	0.125	-	-

TABLE 26

Effect of H_2SO_4 on the amount of copper(I) formed (M) as a function of time in H_2O + AN mixtures containing 20% AN, 0.32 mol dm^{-3} copper sulphate and 8 g copper crystals ($2-30 \mu\text{m}$) in 150 cm^3 of the reaction solution at 25°C .

Time in minutes	M (mol dm^{-3})					
	0.07	0.18	0.28	0.47	0.70	0.94
	H_2SO_4	H_2SO_4	H_2SO_4	H_2SO_4	H_2SO_4	H_2SO_4
	mol dm^{-3}	mol dm^{-3}	mol dm^{-3}	mol dm^{-3}	mol dm^{-3}	mol dm^{-3}
1	0.024	0.034	0.044	0.051	0.049	0.044
5	0.185	0.195	0.251	0.266	0.263	0.232
10	0.302	0.351	0.405	0.432	0.412	0.402
15	0.379	0.449	0.495	0.515	0.502	0.495
20	0.421	0.505	0.529	0.561	0.544	0.546
25	0.450	0.539	0.563	0.578	0.568	0.571
30	0.474	0.549	0.580	0.590	0.580	0.580
35	0.493	0.551	0.590	0.598	0.590	0.590
40	0.517	0.573	0.593	0.602	0.593	0.600
45	0.521	0.585	0.595	0.605	0.598	0.602
50	0.540	0.590	-	0.612	0.607	0.607

TABLE 27

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 35°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	0.0032	0.0064	0.013
5	0.038	0.057	0.070
7.5	0.067	-	-
10	0.074	0.100	0.113
15	0.091	0.119	0.135
20	0.098	0.133	0.152
25	0.107	0.143	0.159
30	0.112	0.148	0.166
35	0.114	0.148	0.166
40	0.114	0.152	0.168
45	0.117	-	0.168

TABLE 28

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 35°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
1	0.048	0.054	0.061
2.5	0.090	0.110	0.149
5	0.141	0.176	0.245
7.5	-	0.229	0.313
10	0.180	0.262	0.365
15	0.205	0.307	0.423
20	0.214	0.326	0.457
25	0.219	0.350	0.476
30	0.229	0.371	0.493
35	-	0.383	0.507
40	-	0.383	0.512
45	-	0.388	0.519
50	-	0.400	0.524
55	-	-	0.529
60	-	-	0.531
65	-	-	0.539
70	-	-	0.541
75	-	-	0.543
80	-	-	0.543
85	-	-	0.553
90	-	-	0.558
95	-	-	0.558

TABLE 29

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 35°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.069	0.166	0.181
5	0.143	0.277	0.333
7.5	0.171	0.337	0.400
10	0.205	0.375	0.448
15	0.224	0.399	0.498
20	0.231	0.409	0.514
25	0.236	0.418	0.529
30	0.236	0.428	0.543
35	0.236	0.433	0.548
40	-	0.433	0.552
45	0.236	0.440	0.557
50	-	-	0.562
55	-	0.440	0.571
60	-	0.440	0.581
65	-	-	0.581
70	-	-	0.586
75	-	-	0.591
80	-	-	0.595
85	-	-	0.605

TABLE 30

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 45°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.039	0.055	0.068
5	0.056	0.087	0.102
7.5	0.073	0.100	0.121
10	0.080	0.117	0.138
15	0.095	0.138	0.158
20	0.102	0.148	0.165
25	0.109	0.148	0.172
30	0.117	0.158	0.172
35	0.117	0.158	0.172
40	0.119	0.158	0.172
45	0.121	0.158	-
50	0.124	-	-

TABLE 31

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 45°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.115	0.170	0.176
5	0.158	0.240	0.290
7.5	0.180	0.277	0.350
10	0.199	0.310	0.390
15	0.216	0.364	0.438
20	0.223	0.379	0.460
25	0.226	0.386	0.479
30	0.233	0.391	0.491
35	0.233	-	0.505
40	-	-	0.514
45	-	-	0.514
50	-	-	0.524
55	-	-	0.533
60	-	-	0.538
65	-	-	0.543
70	-	-	0.543
75	-	-	0.552
80	-	-	0.552
85	-	-	0.552
90	-	-	0.557

TABLE 32

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 45°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.151	0.275	0.320
5	0.204	0.350	0.425
7.5	0.216	0.380	0.470
10	0.226	0.395	0.486
15	0.235	0.410	0.519
20	0.240	0.420	0.533
25	0.240	0.430	0.548
30	0.240	0.434	0.548
35	0.240	0.437	0.552
40	0.240	0.437	0.562
45	-	0.437	0.562
50	-	0.437	0.567
55	-	-	0.571
60	-	-	0.571
65	-	-	0.581
70	-	-	0.581
75	-	-	0.591
80	-	-	0.600
85	-	-	-
90	-	-	0.614

TABLE 33

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 55°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.041	0.057	0.064
5	0.060	0.086	0.098
7.5	0.074	0.105	0.119
10	0.086	0.119	0.133
15	0.098	0.136	0.152
20	0.112	0.148	0.162
25	0.117	0.152	0.167
30	0.121	0.157	0.169
35	0.126	0.157	0.169
40	-	0.157	0.169
45	-	0.157	0.169

TABLE 34

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 55°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.121	0.160	0.186
5	0.162	0.236	0.295
7.5	0.179	0.283	0.355
10	0.195	0.319	0.393
15	0.212	0.355	0.443
20	0.217	0.376	0.471
25	0.221	0.388	0.491
30	0.226	0.393	0.500
35	0.226	0.395	0.519
40	-	0.398	0.524
45	-	0.400	0.533
50	-	0.400	0.533
55	-	0.400	0.543
60	-	-	0.548
65	-	-	0.552
70	-	-	0.557
75	-	-	0.567
80	-	-	0.567
85	-	-	0.571
90	-	-	0.581
95	-	-	0.581

TABLE 35

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 55°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.152	0.281	0.335
5	0.195	0.355	0.440
7.5	0.210	0.388	0.480
10	0.214	0.402	0.505
15	0.224	0.421	0.544
20	0.229	0.424	0.561
25	0.233	0.436	0.561
30	-	0.436	0.576
35	-	0.436	0.576
40	-	0.436	0.576
45	-	0.436	0.585
50	-	-	0.585
55	-	-	0.595
60	-	-	0.595
65	-	-	0.599
70	-	-	0.610
75	-	-	0.615
80	-	-	0.620
85	-	-	0.624
90	-	-	0.640

TABLE 36

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 65°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.041	0.060	0.067
5	0.063	0.079	0.096
7.5	0.075	0.101	0.115
10	0.087	0.115	0.127
15	0.099	0.130	0.147
20	0.113	0.144	0.159
25	0.115	0.152	0.166
30	0.118	0.159	0.166
35	0.120	0.161	0.171
40	-	0.164	0.171
45	-	0.164	0.171
50	-	0.164	-
55	-	0.164	-

TABLE 37

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 65°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.122	0.170	0.185
5	0.173	0.245	0.300
7.5	0.198	0.290	0.360
10	0.202	0.332	0.395
15	0.202	0.368	0.450
20	0.212	0.381	0.475
25	0.220	0.398	0.490
30	0.221	0.400	0.505
35	0.221	0.407	0.525
40	0.221	0.407	0.528
45	0.221	0.407	0.530
50	-	-	0.551
55	-	-	0.551
60	-	-	0.551

TABLE 38

Amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 65°C.

Time in minutes	M (mol dm ⁻³)		
	5% AN	10% AN	20% AN
2.5	0.158	0.281	0.350
5	0.214	0.363	0.465
7.5	0.221	0.389	0.502
10	0.224	0.404	0.524
15	0.228	0.416	0.543
20	0.228	0.421	0.553
25	0.233	0.426	0.560
30	0.233	0.430	0.565
35	0.233	0.430	0.570
40	0.233	0.430	0.575
45	-	0.430	0.579
50	-	0.430	0.579
55	-	-	0.582
60	-	-	0.587
65	-	-	0.594
70	-	-	0.596
75	-	-	0.606
80	-	-	0.611
85	-	-	0.615
90	-	-	0.620

TABLE 39

Effect of the surface area of the copper crystals on the amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 20% AN, 0.32 mol dm⁻³ copper sulphate and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C (stirring speed 1200 r.p.m.).

Time in minutes	M (mol dm ⁻³)			
	45 cm ²	75 cm ²	150 cm ²	210 cm ²
1	0.0085	0.0099	0.038	0.038
2.5	0.026	0.048	0.096	0.115
5	0.048	0.102	0.173	0.266
10	0.083	0.192	0.288	0.387
15	0.112	0.243	0.370	0.443
30	0.150	0.381	0.464	0.531
45	0.164	0.460	0.500	0.557
60	0.171	0.500	0.517	0.574
75	0.171	0.524	0.529	0.579
90	-	-	0.533	0.591
105	-	-	0.543	0.591
120	-	-	0.552	0.598
135	-	0.538	0.557	0.605
150	-	-	0.562	0.614
165	-	-	-	-
180	-	-	-	-
195	-	-	0.576	0.638

TABLE 40

Effect of the stirring speed on the amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 25°C.

Time in minutes	M (mol dm ⁻³)					
	0 r.p.m.	300 r.p.m.	700 r.p.m.	800 r.p.m.	1000 r.p.m.	1200 r.p.m.
1	0.012	0.019	0.023	0.024	0.033	0.038
5	-	0.094	0.159	0.181	0.236	0.266
10	-	0.185	0.279	0.302	0.371	0.387
15	0.075	0.248	0.349	0.379	0.429	0.443
20	-	0.305	0.399	0.421	0.467	0.486
25	-	0.344	0.435	0.450	0.491	0.515
30	0.113	0.380	0.462	0.474	0.505	0.531
35	-	0.411	0.481	0.493	0.529	0.547
40	-	0.433	0.500	0.517	0.529	0.554
45	0.142	0.450	0.507	0.521	-	0.557
50	-	0.464	0.522	0.540	-	-
55	-	0.476	-	0.540	-	0.574
60	0.173	0.490	-	0.545	-	0.574
65	-	0.500	-	0.557	-	0.580
70	-	0.510	-	0.564	-	0.590
75	0.197	-	-	0.574	-	0.599
80	-	-	-	-	-	0.605
85	-	-	-	0.574	-	0.611
90	0.219	-	-	0.583	-	0.614
95	-	-	-	-	-	-
100	-	-	-	0.588	-	-
105	0.236	-	-	0.593	-	-
110	-	-	-	0.598	-	-
115	-	-	-	0.602	-	-
120	0.262	-	-	0.602	-	-

TABLE 41

Effect of the stirring speed on the amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 35°C.

Time in minutes	M (mol dm ⁻³)					
	0 r.p.m.	300 r.p.m.	700 r.p.m.	800 r.p.m.	1000 r.p.m.	1200 r.p.m.
1	0.022	0.030	0.078	-	0.146	0.159
5	-	0.150	0.283	0.333	0.351	0.367
10	-	0.295	0.388	0.448	0.468	0.468
15	0.078	0.352	0.439	0.498	0.515	0.524
20	-	0.375	0.466	0.514	0.539	0.546
25	-	0.411	0.488	0.529	0.556	0.561
30	0.132	0.442	0.505	0.543	0.563	0.576
35	-	0.465	0.522	0.548	0.573	0.580
40	-	0.482	0.529	0.552	0.580	0.585
45	0.188	0.503	0.544	0.557	0.585	0.593
50	-	0.521	0.544	0.562	-	-
55	-	0.530	-	0.571	-	-
60	0.229	0.545	-	0.581	-	0.598
65	-	0.556	-	0.581	-	-
70	-	0.565	-	0.586	-	-
75	0.256	-	-	0.591	-	0.612
80	-	-	-	0.595	-	-
85	-	-	-	0.605	-	-
90	0.285	-	-	-	-	0.615
105	0.312	-	-	-	-	0.622
120	0.334	-	-	-	-	0.624
135	0.344	-	-	-	-	0.629
150	0.371	-	-	-	-	-

TABLE 42

Effect of the stirring speed on the amount of copper(I) formed (M) as a function of time in H₂O + AN mixtures containing 20% AN, 0.32 mol dm⁻³ copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm⁻³ of H₂SO₄ in 150 cm³ of the reaction solution at 45°C.

Time in minutes	M (mol dm ⁻³)					
	0 r.p.m.	300 r.p.m.	700 r.p.m.	800 r.p.m.	1000 r.p.m.	1200 r.p.m.
1	0.070	0.090	0.102	-	0.173	0.178
5	-	0.290	0.312	0.425	0.407	0.410
10	-	0.355	0.405	0.486	0.493	0.495
15	0.110	0.400	0.454	0.519	0.532	0.534
20	-	0.431	0.485	0.533	0.546	0.551
25	-	0.456	0.515	0.548	0.561	0.568
30	0.161	0.480	0.524	0.548	0.576	0.580
35	-	0.505	0.541	0.552	0.580	0.580
40	-	0.525	0.551	0.562	0.590	0.593
45	0.205	0.535	0.559	0.562	-	0.600
50	-	0.557	-	0.567	-	-
55	-	0.565	-	0.571	-	-
60	0.241	-	-	0.571	-	0.607
65	-	-	-	0.581	-	-
70	-	-	-	0.581	-	-
75	0.273	-	-	0.591	-	0.615
80	-	-	-	0.600	-	-
85	-	-	-	-	-	-
90	0.300	-	-	0.614	-	0.617
105	0.324	-	-	-	-	0.627
120	0.341	-	-	-	-	0.639
135	0.361	-	-	-	-	0.640
150	0.383	-	-	-	-	-
165	0.398	-	-	-	-	-

TABLE 43

Change of copper(I) concentration as a function of time
in H₂O + AN mixture containing 10% AN at 80 ± 2°C

Time in minutes	Concentration of Cu ₂ SO ₄ (mol dm ⁻³) used			
	0.10	0.20	0.30	0.40
1	0.099	0.190	0.290	0.390
10	0.087	0.171	0.250	0.341
20	0.077	0.159	0.226	0.305
30	0.067	0.136	0.190	0.250
40	0.060	0.124	0.174	0.201
50	0.046	0.098	0.140	0.159
60	0.034	0.076	0.114	0.110
70	0.022	0.050	0.060	0.079
80	0.017	0.040	0.040	0.049
90	0.014	0.031	0.029	0.031
100	-	0.019	0.019	0.024
110	-	0.012	0.017	0.018
120	-	-	0.012	-

TABLE 44

Change of copper(I) concentration as a function of time
in H₂O + AN mixture containing 20% AN at 80 ± 2°C

Time in minutes	Concentration of Cu ₂ SO ₄ (mol dm ⁻³) used				
	0.10	0.20	0.30	0.40	0.60
1	0.101	0.202	0.302	0.402	0.605
10	0.102	0.205	0.305	0.405	0.610
20	0.103	0.210	0.315	0.410	0.620
30	0.105	0.215	0.298	0.405	0.506
40	0.087	0.220	0.259	0.349	0.415
50	0.075	0.190	0.209	0.271	0.310
60	0.058	0.155	0.174	0.198	0.201
70	0.041	0.110	0.138	0.144	0.134
80	0.026	0.093	0.081	0.084	0.079
90	0.019	0.040	0.055	0.066	0.037
100	0.012	0.026	0.045	0.030	0.024
110	-	0.014	0.024	0.024	0.018
120	-	-	0.017	0.018	-

TABLE 45

Change of copper(I) concentration as a function of time
in H₂O + AN mixture containing 30% AN at 80 ± 2°C

Time in minutes	Concentration of Cu ₂ SO ₄ (mol dm ⁻³) used				
	0.10	0.20	0.30	0.40	0.60
1	0.101	0.205	0.302	0.400	0.610
10	0.113	0.212	0.315	0.427	0.625
20	0.120	0.228	0.343	0.445	0.652
30	0.127	0.245	0.347	0.463	0.678
40	0.125	0.240	0.370	0.480	0.622
50	0.108	0.217	0.314	0.391	0.568
60	0.101	0.193	0.257	0.337	0.466
70	0.085	0.157	0.219	0.240	0.335
80	0.072	0.145	0.157	0.168	0.233
90	0.053	0.102	0.102	0.096	0.120
100	0.038	0.062	0.057	0.054	0.090
110	0.026	0.040	0.038	0.036	0.054
120	0.017	0.026	0.021	0.024	0.036
130	-	0.017	0.017	-	0.018

TABLE 46

Change of copper(I) concentration as a function of time
in H₂O + AN mixture containing 40% AN at 80 ± 2°C

Time in minutes	Concentration of Cu ₂ SO ₄ (mol dm ⁻³) used					
	0.10	0.20	0.30	0.40	0.60	1.12
1	0.102	0.205	0.302	0.405	0.606	1.12
10	0.118	0.216	0.326	0.433	0.640	1.13
20	0.127	0.245	0.355	0.475	0.694	1.16
30	0.137	0.260	0.386	0.517	0.740	1.17
40	0.148	0.279	0.409	0.547	0.765	1.19
50	0.160	0.295	0.440	0.577	0.791	1.04
60	0.142	0.274	0.386	0.493	0.688	0.896
70	0.120	0.255	0.336	0.397	0.592	0.774
80	0.100	0.216	0.276	0.313	0.454	0.549
90	0.077	0.147	0.209	0.204	0.341	0.402
100	0.051	0.094	0.143	0.138	0.233	0.256
110	0.038	0.055	0.086	0.078	0.138	0.171
120	0.022	0.031	0.050	0.054	0.084	0.085
130	0.014	0.022	0.031	0.024	0.036	0.049
140	-	-	0.019	0.018	0.024	-

TABLE 47

Change of copper(I) concentration as a function of time
 in H₂O + AN mixtures containing 50 and 60% AN
 at 80 ± 2°C

Time in minutes	Concentration of Cu ₂ SO ₄ (mol dm ⁻³) used			
	50% AN			60% AN
	1.45	1.57	1.93	1.82
1	1.45	1.57	1.93	1.82
10	1.48	1.59	1.95	1.98
20	1.52	1.64	2.01	2.04
30	1.62	1.72	2.07	2.13
40	1.64	1.74	2.15	2.23
50	1.65	1.57	1.82	2.29
60	1.52	1.41	1.71	2.39
70	1.31	1.13	1.51	2.21
80	1.18	0.982	1.30	1.70
90	1.07	0.726	1.01	1.42
100	0.860	0.543	0.799	1.11
110	0.561	0.366	0.573	0.732
120	0.402	0.214	0.451	0.488
130	0.220	0.104	-	0.311
140	0.110	-	-	-
150	0.061	-	-	-

LIST OF PUBLICATIONS

1. Kinetic Studies of the Formation of Copper(I) in Water + Acetonitrile Mixtures at 25°C from the Reversible Reaction $\text{Cu}^{2+} + \text{Cu}^0 \rightleftharpoons 2\text{Cu}^+$.
D.S. Gill and R. Srivastava, J. Chem. Soc. Faraday Trans. I, 78, 1533 (1982).
2. Kinetics of Formation of Copper(I) in Water + Acetonitrile Mixtures in Reversible Reaction $\text{Cu}^{2+} + \text{Cu}^0 \rightleftharpoons 2\text{Cu}^+$:
Part II.
D.S. Gill and R. Srivastava, Indian J. Chem., 22A, 140 (1983).
3. A Novel Method for Purification of Copper-Kinetics of the Reaction $2\text{Cu}^+ \rightleftharpoons \text{Cu}^{2+} + \text{Cu}^0$ in Water + Acetonitrile Mixtures.
D.S. Gill and R. Srivastava, Indian J. Chem., (in press).
4. Preferential Solvation of Ions in Mixed Solvents-II.
Preferential Solvation of Cu^+ in Acetonitrile + Water Mixtures and the Utility of Such Studies in the Hydrometallurgy of Copper.
D.S. Gill and R. Nording, Z. Phys. Chem. (N.F.), (accepted for publication).

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