10/3/23 Dye bleaching expt in Bn, Me, [Mn Bcyc - resin complex (solid phase) $[Mn(2)]^{2+}$ MO

set ① → dye 10ml (MO) + 10 ml H_2O + complex-resin (set 1)

→ adjust PH to 7 → make up to 25 ml → add 0.25 M H_2O_2 (Methyl Orange)

(150 rpm) shaker ←

set ② → same as set ①

set ③ → NO H_2O_2

	1st cycle set ①	1st cycle set ②	1st cycle/NO H_2O_2 set ③
9:40 am	0.412	0.425	0.420
(10) A 0 → 9:51 am →	0.370		
(15) 9:56 am →	0.342		
(20) 10:02 am →	0.304		
(25) 10:07 am →	0.271		
(30) 10:13 am →	0.226		
(35) 10:19 am →	0.192		
(48) 10:33 am →	0.115	0.194	0.415
-3 min (63) 10:51 am →	0.065	0.130	0.417
-2 min (82) 11:12 am →	0.047	0.083	0.421
-4 min (98) 11:32 am →	0.037	0.067	0.411
-3 min (121) 11:58 am →	0.028	0.052	0.414
(145) 12:27 pm →	0.022	0.044	0.425

$[Mn(2)]^{2+}$ Recycled the sets for another set of MO dye-bleaching. Did not filter this time, pipetted out soln, leaving resin beads at bottom. Bn, Me, Mn (BMM) complex (recycled)

Set ① → MO (10ml) + H_2O (10ml) + resin-complex set ①
→ adjust PH to 7 → make up to 25 ml → 0.25 ml H_2O_2 → shaker (150 rpm)

Set ② → MO (10ml) + H_2O (10ml) + resin-complex (recycled set ②)
→ adjust pH to 7 → make up to 25 ml → 0.25 ml H_2O_2 → shaken

Set ③ → MO (10 ml) + H_2O (10ml) + resin-complex (recycled set ③)
→ adjust pH to 7 → 25 ml → 0.25 ml H_2O_2 → shaken

2nd cycle

	Set ①	Set ②	set ③
2:20 pm →	0.400	0.407	0.372
(5 min) 2:27 pm →	0.381		
(10) 2:32 pm →	0.393		
(16) 2:41 pm →	0.388		
-2 min (30) 2:55 pm →	0.384	~~0.234~~	0.224
(45) 3:13 pm →			0.185
(62) 3:33 pm →	0.383	0.385	0.132
(96) 4:10 pm →			0.104
(136) 4:53 pm →	0.377	0.385	0.075
10/4/23 9:30 am → (1130)	0.362 2nd cycle ∞ H_2O_2	0.374 2nd cycle ∞ H_2O_2	0.037 2nd cycle, 1st cycle ∞ H_2O_2

?? Probably, Bn, Me, [Mn Bcyclam] Cl_2 in presence of H_2O_2 deactivates the metal complex catalyst for bleaching

10/9/23 Solid phase dye bleaching of Bn, Me, [MnBcyclam] Cl_2 – resin complex for (MB) bleaching ** $[Mn(2)]^{2+}$

set (1) → 10 ml MB + 10 ml H_2O + resin-complex → adjust pH to 7

add 0.25 ml H_2O_2 ← make up vol. to 25 ml ←

Set (2) → same as set (1) (1st cycle)

Set (3) → 10 ml MB + 10 ml H_2O + resin-complex → pH 7 → 25 ml NO H_2O_2 ←

	1st cycle Set (1)		1st cycle Set (2)		1st cycle NO H_2O_2 Set (3)	
9:55 am A_0 → (20 min)	0.798, (at 664 nm)	0.452 (290 nm)	0.794, (664 nm)	(0.462) (290 nm)	0.766, (664 nm)	0.432 (290 nm)
10:15 am → (34)	0.578,	0.335	0.544,	0.314	0.646,	0.362
−3 min (48) 10:32 am →	0.474,	0.284	0.445,	0.269	0.585,	0.325
−3 min (68) 10:50 am →	0.354,	0.228	0.352,	0.227	0.524,	0.294
11:11 am → −3 min → (67)	0.214,	0.154	0.238,	0.158	0.457,	0.270
−3 min → (83) 11:30 am →	0.097,	0.085	0.107,	0.075	0.326,	0.205
−3 min (98) 11:48 am →	0.056,	0.068	0.065,	0.071	0.351,	0.192
−4 min (114) 12:08 pm →	0.041,	0.069	0.050,	0.070	0.307,	0.169
−4 min (128) 12:26 pm →	0.033,	0.066	0.035,	0.064	0.270,	0.146
1:19 pm (180) →					0.165,	0.088
1:52 pm (210) →	About		(2 hr)		0.114,	0.045
2:27 pm (244) →	to degrade				0.072,	0.040
(260)						

Filtered the set ① & set ② & started second cycle on them.

(10/9/23)	2nd cycle set ①		set ② 2nd cycle	
2:25 pm A_o →	0.920	0.530	0.904,	0.519
(17)	(664 nm)	(290 nm)	(664 nm)	(290 nm)
2:42 pm →	0.886,	0.505	0.864,	0.498 [Mn(2)]$^{2+}$
(33) – 3 min				
3:01 pm →	0.875,	0.505	0.836,	0.486 – MB
(61) – 2 min				
3:31 pm →	0.844,	0.488	0.812,	0.468
(89)				
4:01 pm →	0.812,	0.466	0.778,	0.453
(117)				
4:31 pm →	0.800,	0.461	0.764,	0.435
(150)				
5:06 pm →	0.772,	0.442	0.734,	0.424
(192)				
5:50 pm →	0.738,	0.424	0.694,	0.402
(10/10/23) (1117)				
9:15 am →	0.300,	0.207	0.200,	0.150
(1197)				
10:35 am →	0.258,	0.155	0.164,	0.111
(1287)				
12:05 pm →	0.204,	0.121	0.126,	0.079
(1387)				
1:45 pm →	0.160,	0.092	0.090,	0.056
(1490)				
3:50 pm →	0.101	0.061		
(1557)				
4:56 pm →	0.075	0.049		

Filtered off set ① & set ② catalysts.

Do not look very clean after filtering. (Some blueish residue forms)

10/10/23 Dye bleaching of (MB) with set 3 recycled from 10/9/23 (solid phase)

set (3) → 10 ml MB + 10 ml H_2O → adjust pH to 7 → 25 ml + resin-complex (set (3) from 10/9/23) shaker (150 rpm)

~~set (2)~~ → Current cycle will be (2nd) cycle

~~set (1)~~ w/o H_2O_2.

$[Mn(2)]^{2+}$

Looks very clean when filtered.

2nd cycle w/o H_2O_2 NO H_2O_2

	set (3)	~~set (2)~~	~~set (1)~~
10:01 am A$_0$ → (25)	0.848,	0.487	
10:26 am → (50)	0.756,	0.432	
10:51 am → (75)	0.695,	0.397	
11:16 am → (100)	0.642,	0.364	
11:41 am → (125)	0.586,	0.330	
12:06 pm → (150)	0.538,	0.305	
−2 min 12:33 pm → (196)	0.487,	0.272	
1:19 pm → (236)	0.411,	0.230	
2:01 pm → (281)	0.354,	0.195	
2:47 pm → (323)	0.291,	0.158	
3:30 pm → (374)	0.234,	0.128	
4:20 pm → (424)	0.180	0.102	
5:10 pm → (483)	0.130	0.076	
6:09 pm →	0.084	0.051	

10/10/23

Dye bleaching of (MB) with resin -complex recycled from 10/9/23 (solid phas.

set (2) → 10 ml MB + 10 ml ~~dye~~ H_2O + resin -complex (set (2) from 10/9/23

→ adjust pH → 25 ml → 0.25 ml H_2O_2 → shake

Current cycle will be (3rd) cycle w̄ H_2O

$[Mn(2)]^{2+}$

~~Bn, Me, Mn (BMM)~~ II

(3rd cycle) (set (2))

~~time~~	~~set (1)~~	time	set (2)	
	10/10/23	2:39 pm (A_0) →	0.928,	0.531
		3:11 pm (32) →	0.884,	0.509
		3:41 pm (62) →	0.856,	0.489
		4:11 pm (92) →	0.834,	0.483
		5:04 pm (145) →	0.784	0.447
		6:09 pm (210) →	0.729	0.415
	10/11/23	10:00 am (1161) →	0.118	0.068
		11:00 am (1221) →	0.094	0.065

(A4)

10/11/23 Dye bleaching of MB with resin-complex recycled from 10/9/23 (solid-phase)

~~Bn, Me, Mn (BMM)~~ $[Mn(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex (recycled from 10/9 set ①)

→ adjust pH → 25 ml → add 0.25 ml H_2O_2 → shaker (150 rpm)

Current cycle will be 3rd cycle for this.

set ③ ⇒ 10 ml MB + 10 ml H_2O + resin-complex (recycled from 10/9/23 set ③)

→ adjust pH → 25 ml → NO H_2O_2 → shaker (150 rpm)

Current cycle will be 3rd cycle for this.

	3rd cycle set ①		3rd cycle (NO H_2O_2) set ③	
9:46 am A_0 →	0.940,	0.546	0.908,	0.524
10:17 am (31) →	0.893	0.520	0.822,	0.471
10:47 am (59) - 2 min →	0.869	0.510	0.778,	0.446
11:38 am (110) →	0.832	0.485	0.706,	0.404
12:30 pm (160) →	0.797	0.458	0.647,	0.366
1:30 pm (220) →	0.765	0.435	0.584,	0.325
2:30 pm (280) →	0.726	0.408	0.527,	0.290
3:45 pm (355) →	0.670	0.379	0.454,	0.253
4:43 pm (410) →	0.631	0.355	0.404,	0.221

10/12/23

~~Mn~~ $[Mn(2)]^{2+}$

II

~~Bn, Me, Mn (BMM) complex~~

10/11/23 Dye bleaching of (MB) with resin complex

set ② recycled from 10/9/23

set ② → 10 ml MB + 10 ml H_2O + resin-complex (recycled from 10/9/23 set ②)

→ adjust pH to 7 → 25 ml → add 0.25 ml H_2O_2 → (150 rpm) shaker

Current cycle will be (4th) cycle for this.

time	set ②		
11:31 am, A_0 →	0.888,	0.511	
(35) 12:06 pm →	0.845,	0.488	next day 8:30 pm
(75) 12:46 pm →	0.819,	0.468	↓
(135) 1:46 pm →	0.793	0.455	↓
(193) 2:44 pm →	0.761	0.432	0.035, 0.022
(265) 3:56 pm →	0.721	0.404	
(96) (323) 4:54 pm →	0.674	0.379	

MB

~~Bn, Me, Mn (BMM)~~ II $[Mn(2)]^{2+}$

	4th cycle Set ①	5th cycle Set ②	4th cycle NO H_2O_2 Set ③
10:15 am A → (45)	0.932, 0.533	0.930, 0.530	0.936, 0.532
11:00 am → (160)	0.854, 0.493	0.873, 0.496	0.790, 0.445
12:57 pm → (218)	0.783, 0.453	0.796, 0.451	0.618, 0.348
1:57 pm → (276)	0.742, 0.423	0.751, 0.422	0.556, 0.303
2:57 pm → (346)	0.693, 0.396	0.715, 0.401	0.501, 0.268
4:09 pm → (390)	0.640, 0.358	0.665, 0.371	0.441, 0.236
4:55 pm → (443)	0.598, 0.335	0.634, 0.350	0.409, 0.216
5:50 pm →	0.563, 0.312	0.597, 0.327	0.365, 0.192
10/17/23 9:15 am → (1368)	0.054, 0.036	0.163, 0.093	0.040, 0.029
11:40 am → ~~(1468)~~ (1513)		0.118, 0.070	
1:20 pm → (1613) ~~(1608)~~		0.088, 0.057	
3:40 pm → (1753)		0.061, 0.047	

10/17/23 Dye bleaching of (MB) ϖ resin complex

Bn, Me, [MnBcyclam]Cl_2 recycled from (solid phase) 10/9/23

10:36 $[Mn(2)]^{2+}$

set ① → 10 ml MB + 10 ml H_2O + resin-complex (recycled from 10/9/23 set ①) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle will be (5th) cycle for this.

set ③ → 10 ml MB + 10 ml H_2O + resin-complex (recycled from 10/9/23 set ③) → pH 7 → 25 ml → NO H_2O_2 → shaker

Current cycle will be (5th) cycle for this.

	set ① 5th cycle		set ③ 5th cycle NO H_2O_2	
10:36 am				
A_0 → (64)	0.974,	0.566	0.945,	0.552
11:40 am →	0.932,	0.546	0.896,	0.506
1:20 pm → (164)	0.871,	0.505	0.810,	0.459
3:40 pm → (304)	0.810,	0.468	0.736,	0.413
4:45 pm → (369)	0.782,	0.446	0.702,	0.397
10/18/23 (1384)				
9:40 am → (1454)	0.396,	0.202	0.348,	0.182
10:52 am → (1604)	0.368,	0.200	0.324,	0.173
1:23 pm →	0.314,	0.174	0.290,	0.154
10/19/23	0.035,	0.027	0.085,	0.057
10:00 am (2844)				

10/23/23 Dye bleaching of (RhB) using ~~Bu₄Me,~~ ~~Mn(II)~~ ~~(CBMA)~~ resin complex from 10/20/23

** $[Mn(2)]^{2+}$ (1st cycle)

Set ① → 10 ml RhB + 10 ml H_2O → pH 7 → 25 ml + resin-complex set ① → add 0.25 ml H_2O_2 ← shaker (150 rpm)

Set ② → 10 ml RhB + 10 ml H_2O + resin-complex set ② → pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker

Set ③ → 10 ml RhB + 10 ml H_2O + reson-complex set ③ → pH 7 → 25 ml → ~~add 0.25 ml~~ H_2O_2 X (NO H_2O_2) → shaker (150 rpm)

NO H_2O_2

	Set ①	Set ②	Set ③ NO H_2O_2
10:12am A_0 →	1.099 (551.7 nm)	1.133	1.009
(30) 10:43am →	0.707	0.683	0.890
(58) 11:13am →	0.506	0.515	0.872
(86) 11:43am →	0.376	0.348	0.839
(114) 12:13pm →	0.257	0.247	0.867
(147) 12:48pm →	0.179	0.175	0.788
(182) 1:25pm →	0.124	0.126	0.772
(200) 1:45pm →	0.105	0.105	
(295) 3:22pm →			0.727
(373) 4:42pm →			0.724
10/24/23 (1363) 9:15am →			0.628

$[Mn(2)]^{2+}$ — RhB

Filtered (pipetted out) set ① & set ② & started (2nd) cycle on them.

set ① → 10 ml RhB + 10 ml H_2O + resin-complex (set ① from 1st cycle) → pH 7 → 25 ml (150 rpm) shaker ← 0.25 ml H_2O_2

set ② → 10 ml RhB + 10 ml H_2O + resin-complex (set ② from 2nd cycle) → pH 7 → 25 ml (150 rpm) shaker ← 0.25 ml H_2O_2

	set ① (2nd cycle)		set ② (2nd cycle)
2:52 pm (20) A_0 →	1.062		1.074
3:22 pm (58) →	0.905		0.944
3:52 pm (86) →	0.868		0.849
4:22 pm (114) →	0.828		0.820
4:52 pm →	0.754		0.760
10/24/23			
9:15 am (1097) →	0.377		0.320
11:32 am (1234) →	0.359		0.302
2:45 pm (1427) →	0.332		0.278
4:20 pm (1522) →	0.336	* *	0.266
10/25/23 (2462) 8:00 am →	0.265*	(Not sure if it worked) overnight might be a power cut)	0.208
12:00 pm (2612) →	0.256		0.191
-1.5 hr (3952) 10/26/23 →	0.195	started stirring again at	0.155
10:20 Rm (4362) 5:10 pm →	0.187	9:30 a.m	0.150
(105) 10/27/23 →	0.156	10/25/23	0.131

10/24/23 Dye bleaching of RhB

$[Mn(2)]^{2+}$ 2nd cycle for set ③ (filtered from 10/23/23 resin-complex)

(1st cycle $\bar{w}$ H_2O_2) (RhB + H_2O + H_2O_2 + metal-compl

	time	set ③
	10:32 am, A_o →	1.075
(30)	11:02 am →	0.741
(60)	11:32 am →	0.527
(90)	12:02 pm →	0.419
(120)	12:32 pm →	0.330
(187)	1:39 pm →	0.196
(247)	2:39 pm →	0.133
(277)	3:09 pm →	0.106
(341)	4:13 pm →	0.106
(361)	4:33 pm →	0.073

Molecular weight of Bn, Me, [Fe(Bcyclam)Cl_2]
= (330.52 + 35.45 + 35.45 + 55.84) amu
= 457.26 amu

250 mg resin = 0.00053125 mol Na sites (calcul^n → page 61)

In order to occupy 2% Na sites,

M-L complex needed = $0.00053125 \times \frac{2}{100} \times 457.26$ g

= 0.004858 g = 4.85 mg

For, 250 mg resin [Amberlite IRA-200C (Na)]
4.85 mg Bn, Me, [Fe(CBcyclam)Cl_2] complex

10/27/23

Dye bleaching of (RhB) using resin-complex recycled from 10/23/23

~~Bn, Me, Mn(II)~~ BMM

$[Mn(2)]^{2+}$

set ① ⇒ 10 ml RhB + 10 ml H_2O + resin-complex recycled from 10/23 set ① → pH 7 → add 0.25 ml H_2O_2 → shaker (150 rpm)

② Current cycle will be (3rd) cycle.

③

set ② ⇒ 10 ml RhB + 10 ml H_2O + resin-complex recycled from 10/23 set ② → pH 7 → add 0.25 ml H_2O_2 → shaker (150 rpm)

Current cycle will be (3rd) cycle.

set ③ ⇒ 10 ml RhB + 10 ml H_2O + resin-complex recycled from 10/23 set ③ → pH 7 → add 0.25 ml H_2O_2 → shaker (150 rpm)

Current cycle will be (3rd) cycle overall, (2nd) cycle w H_2O_2.

	set ①	set ②	set ③
10:40am			
(3:10) A_0 →	1.075	1.054	1.110
10/30/23 9:30 am → (4670)	0.898	1.205	0.195
3:30 pm → (5750)	0.875	1.196	0.182
10/31/23 9:30 am → (6110)	0.866	1.366	0.162
3:30 pm → (7590)	0.827	1.246	0.149
(109) 11/1/23 4:10pm → (20130)	0.787	1.175	0.139
11/10/23 9:00 am →	0.421	0.891	0.054

10/26/23 Dye bleaching of (MO) using resin-Bn, Me, [Fe(Bcyclam)Cl$_2$] complex

$[Fe(2)]^{2+}$ (1st cycle) ①×

Set ① ⇒ 10 ml MO + 10 ml H_2O + resin-complex set ①
→ pH 7 → 25 ml → (NO) H_2O_2 → shaker

Set ② ⇒ 10 ml MO + 10 ml H_2O + resin-complex set ①
→ pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Set ③ ⇒ 10 ml MO + 10 ml H_2O + resin-complex set ①
→ pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

	No H_2O_2 Set ①	Set ②	Set ③
10:05 am			
A_0 →	0.4297 (469.7 nm)	0.414	0.430
(28)			
10:33 am →	0.421	0.364	0.383
~3 min (55)			
11:03 am →	0.432	0.336	0.357
(82)			
11:33 am →	0.428	0.306	0.333
(109)			
12:03 pm →	0.427	0.284	0.311
(136)			
12:33 pm →	0.427	0.262	0.280
(203)			
1:43 pm →	0.427	0.240	0.245
(265)			
2:48 pm →	0.425	0.185	0.208
(322)			
3:48 pm →	0.427	0.164	0.182
(379)			
4:48 pm →	0.428	0.140	0.170
(436)			
5:48 pm →	0.422	0.116	0.134
10/27/23 (1363)			
9:15 am →	0.435	0.030	0.025

10/30/23 Dye bleaching of (MO) using resin-$[Fe(2)]^{2+}$ Bn, Me, [Fe(Bcyclam)Cl_2] complex recycled from 10/26/23

set ① ⇒ 10 ml MO + 10 ml H_2O + resin-complex set ① (recy from 10/26) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (2nd) cycle, (1st) cycle ω H_2O_2

set ② ⇒ 10 ml MO + 10 ml H_2O + resin-complex set ② (recy from 10/26) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (2nd) cycle.

set ③ ⇒ 10 ml MO + 10 ml H_2O + reson-complex set ③ (recycl from 10/26) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (2nd) cycle.

	2nd cycle / 1st cycle ω H_2O_2 set ①	2nd cycle set ②	2nd cycle set ③
10:08 am A_0 →	0.432	0.419	0.406
(148) 10:56 am →	0.383	0.390	0.378
(106) 12:56 pm →	0.262	0.337	0.351
(154) 1:46 pm →	0.230	0.339	0.334
(232) 2:56 pm →	0.185	0.307	0.316
(280) 3:56 pm →	0.166	0.304	0.321
(338) 4:56 pm →	0.142	0.295	0.299
10/31/23 (1313) 9:15 am →	0.030	0.159	0.173
(1386) 10:30 am →	0.026	0.153	0.154
(1444) 11:30 am →	0.029	0.143	0.154
(1562) 1:30 pm →	0.025	0.120	0.144
2:45 pm →	(1635)	0.119	0.133
(110) 11/1/23 3:45 pm →	(1693) (2728)	0.111	0.127

11/1/23

Dye bleaching of (MO) using resin – Bn, Me, [Fe(Bcyclam)Cl$_2$] complex recycled from 10/30/23 [Fe(2)]$^{2+}$

Set ① ⇒ 10 ml MO + 10 ml H_2O + resin-complex (set ①) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (3rd) cycle, (2nd) cycle ∞ H_2O_2.

Set ② ⇒ 10 ml MO + 10 ml H_2O + resin-complex (set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (3rd) cycle.

Set ③ ⇒ 10 ml MO + 10 ml H_2O + resin-complex set ③ → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (3rd) cycle.

(little shift / broadening of peak in maxima observed, as it decays)

	Set ① 3rd cycle	3rd cycle set ② (NO shift)	3rd cycle set ③ (NO shift)
10:45 am A_0 →	0.432	0.434	0.428
12:55 pm (130) →	0.386	0.374	0.367
1:55 pm (188) →	0.375	0.362	0.354
2:55 pm (246) →	0.366	0.355	0.357
3:55 pm (304) →	0.351	0.338	0.325
4:51 pm (358) →	0.336	0.300	0.302
11/2/23 (1343) 9:15 am →	0.146	0.118	0.155
11:00 am (1446) →	0.125	0.101	0.130
12:30 pm (1534) →	0.109	0.088	0.121
2:10 pm (1632) →	0.091	0.074	0.110
3:40 pm (1720) →	0.076	0.056	0.100
5:30 pm →	0.055	0.042	0.075 ← 5:40 pm

11/6/23

Dye bleaching of (MO) using resin-Bn, Me, $[Fe(Bcyclam)Cl_2]$ complex recycled from 10/27/23 ⇒ $[Fe(2)]^{2+}$

Set ① ⇒ 10 ml MO + 10 ml H_2O + resin-complex (recycled from 11/1/23 set ①) → pH 7 → 2.5 ml → 0.25 ml H_2O_2 → shaker

Current cycle will be (4th) cycle, (3rd) cycle in H_2O_2

Set ② ⇒ 10 ml MO + 10 ml H_2O + resin-complex (recycled from 11/1/23 set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle will be (4th) cycle.

Set ③ ⇒ 10 ml MO + 10 ml H_2O + resin-complex (recycled from 11/1/23 set ③) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle will be (4th) cycle.

	Set ①	Set ②	Set ③
9:55 am A_o →	0.413	0.437	0.422
(65 min) 11:00 am →	0.383	0.404	0.425
−20 min (160 min) 12:55 pm →	0.330	0.375	0.378
(252 min) 2:30 pm →	0.283	0.333	0.333
(330 min) 3:50 pm →	0.283	0.314	0.321
(388 min) 4:50 pm →	0.250	0.283	0.298
11/7/23 (1373) 9:15 am →	0.057	0.068	0.098
(1480) 11:05 am →	0.049	0.058	0.077

11/7/23

Dye bleaching of (MO) using resin – Bn, Me, [Fe(Bepclam)Cl_2] complex recycled from 10/27/23 ⇒ $[Fe(2)]^{2+}$

set ① ⇒ 10 ml MO + 10 ml H_2O + resin-complex (recycled from 11/6/23 set①) → pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker

Current cycle will be (5th) cycle, (4th) cycle in H_2O_2.

set ② ⇒ 10 ml MO + 10 ml H_2O + resin-complex (recycled from 11/6/23 set②) → pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker

Current cycle will be (5th) cycle.

set ③ ⇒ 10 ml MO + 10 ml H_2O + resin-complex (recycled from 11/6/23 set③) → pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker

Current cycle will be (5th) cycle..

	set ①	set ②	set ③
12:26 pm A_o ⇒	0.431	0.382	0.400
1:26 pm (60 min) →	0.368	0.372	0.391
2:46 pm (137 min) →	0.329	0.326	0.384
3:46 pm (195 min) →	0.301	0.300	0.350
4:46 pm (253 min) →	0.274	0.285	0.341
11/8/23 9:00 am (1227 min) →	0.053	0.082	0.108
10:50 am (1334 min) →	0.039	0.068	0.092
1:10 pm (1471 min) →	0.027	0.051	0.071

10/19/23 Dye bleaching of MB using resin-complex from 10/18/23 (solid phase)

$[Mn(2)]^{2+}$ 1st cycle / ~~Bn, Me, Mn (BMM)~~

Set ① → 10 ml MB + 10 ml H_2O + resin-complex ① → open (no c

set ① from 10/18/23 → pH 7 → 25 ml → NO H_2O_2 ② → oxy

→ NO lid → shaker ③ → tap wat

set ② → 10 ml MB + 10 ml H_2O + resin-complex

set ② 10/18/23 → pH 7 → 25 ml → NO H_2O_2.

→ Air bubbling through it → NO shaker

set ③ → 10 ml MB + 10 ml Tap Water + resin-comple

Set ③ 10/18/23 → pH 7 → 25 ml → H_2O_2 → shaker

1st cycle

almost same as catalyst, NO H_2O_2 with lid

slower than catalyst NO H_2O_2 w or w/o lid

almost same as distilled water

	Set ①	Set ②	Tap water Set ③
10:36 am			
10:38 am A_0 →	0.750, 0.418	0.877, 0.505	0.885, 0.477
10:58 am (22) →	0.590, 0.330	0.718, 0.406	0.524, 0.321
11:22 am (44) →	0.555, 0.289	0.641, 0.360	0.401, 0.259
11:52 am (70) →	0.446, 0.249	0.591, 0.335	0.232, 0.158
12:22 pm (98) →	0.390, 0.209	0.542, 0.306	0.096, 0.090
12:40 pm (114) →			0.066, 0.082
12:52 pm (124) →	0.317, 0.177	0.494, 0.280	
1:05 pm (134) →			0.045, 0.081
1:55 pm (182) →	0.212, 0.118	0.425, 0.239	
2:57 pm (242) →	0.123, 0.068	0.334, 0.185	
3:57 pm (300) →	0.062, 0.039	0.256, 0.141	
(102) (358)	1:57 pm		

About 2 hr. to degrade

11/6/23 Dye bleaching of (MB) using resin-Bn, Me, [Mn (Bcyclam) Cl$_2$] complex in Pond water

Fishing Hole (Radar Park) water ⇒

$[Mn(2)]^{2+}$

10 ml MB + 10 ml H_2O (Fishing Hole) ⟶ + resin – complex

→ pH 7 → make up to 25 ml → add 0.25 ml H_2O_2 → shaker

(resin bound on 11/2/23)

Time	set ①
(A_0) ⇒ 9:55 am →	(664nm) 0.729 , 0.432 . (290 nm)
10:15 am (20) →	0.548 , 0.335
10:35 am (40) →	0.437 , 0.270
10:55 am (60) →	0.339 , 0.215
11:20 am (85) →	0.219 , 0.149
11:40 am (105) →	0.111 , 0.145
12:00 pm (125) →	0.097 , 0.078
– 20 min (stirring stopped for 20 min)	
12:30 pm (155) →	0.044 , 0.073
12:50 pm (175) →	0.038 , 0.065

Took about (2.5 hr) to degrade.

Little slower than tap water & DI water.

Took about (2 hr) to degrade for

MB

Filtered set ③ & started second cycle on it. 10 ml MB + 10 ml Tap water + complex → pH 7 → 25 ml ↓ shaker ← 0.25 ml H_2O_2

$[Mn(2)]^{2+}$ Tap water

time	set ③ 2nd cycle
2:22 pm	
A_0 (30) →	0.900, 0.522
2:52 pm →	0.823, 0.481
3:22 pm (60) →	0.767, 0.455
4:22 pm (120) →	0.662, 0.387
5:02 pm (160) →	0.601, 0.350
10/20/23	0.020, 0.018
9:00 am (1120) →	~~0.005, 0.001~~

10/20/23

(GTE06)

Ionic binding of Bn, Me, [Mn (Bcyclam) Cl_2] complex with resin Amberlite IRA-200C (Na)

Calculation - page 80

	~~set ①~~	set ②	set ③
resin	0.2511 g	0.2570 g	0.2515 g
complex	0.0055 g	0.0052 g	0.0052 g
water	25 ml (Pipette)	25 ml	25 ml

Resin kept in water for 15 min to swell.

Then resin, complex & water were ~~stirred~~ shaked together for 2 hr. (shaker 150 rpm)

11/9/23

Dye bleaching of (MB) using resin-Mn[(Bn,Me Bcyclam)Cl$_2$] complex recycled from 11/6/23 set ① and 10/19/23 set ③ ⇒ $[Mn(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml (pond) water + resin-complex recy from 11/6/23 set ① → pH 7 → 25 ml → 0.25 ml H_2O_2 ↓ shake

Current cycle is (2nd) cycle.

set ② ⇒ 10 ml MB + 10 ml (tap) water + resin-complex recy from 10/19/23 set ③ → pH 7 → 25 ml → 0.25 ml H_2O_2 → sh

Current cycle is ~~2nd~~ (3rd) cycle, after (19) days.

	set. ① Pond Water	set ② Tap Wate
9:53 am A_0 →	0.731, 0.451	0.902, 0.553
(24) 10:17 am ⇒	0.631, 0.387	0.816, 0.530
(42) 10:37 am ⇒	0.569, 0.348	0.786, 0.493
(70) 11:07 am ⇒	0.488, 0.290	0.761, 0.466
(128) 12:07 pm ⇒	0.378, 0.230	0.685, 0.416
(194) 1:15 pm ⇒	0.276, 0.168	0.620, 0.377
(252) 2:15 pm ⇒	0.204, 0.124	0.559, 0.338
NOTE ⇒	~~Pond~~ MB seems to be ppt. out rather than bleaching	NO noticable ppt^n
310 3:15 pm ⇒	0.128, 0.083	0.509, 0.304
(400) 4:45 pm ⇒	0.088, 0.060	0.409, 0.245
	(NO Noticible ppt^n)	
	Took about	
(1375)	(7 hr) to degrade	
11/10/23 a:00 am	0.016, 0.017	0.014, 0.009

11/20/23 Dye bleaching of (MB) using resin-Mn [(Bn, Me, Beyelam) Cl_2] complex recycled from 11/9/23 set ① + set ③ ⇒ $[Mn(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml (pond) water + resin — complex recycled from 11/9/23 set ① → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

Current cycle is (3rd) cycle.

set ② ⇒ 10 ml MB + 10 ml (tap) water + resin-complex recycled from 11/9/23 set ② → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker (4th)

Current cycle is (2nd) cycle.

	set ① (pond water)		set ② (tap water)	
9:40 am A_0 →	(664 nm) 0.785,	(290 nm) 0.495	0.861,	0.563
10:40 (60) am →	0.614,	0.379	0.728,	0.461
12:50 (190) pm →	0.445,	0.271	0.572,	0.360
2:55 (313) pm →	0.337,	0.206	0.469,	0.289
4:55 (430) pm →	0.262,	0.163	0.378,	0.239
11/21/23 (1425) 9:30 am →	0.067,	0.049	0.043,	0.031
	Little precipitation (less than last time) small floating particles		Oil like floating layer / particles suspended (last time, no such observation)	

11/27/23 Dye bleaching of MB using resin - Mn[(Bn, M
$[Mn(2)]^{2+}$ Bcyclam)Cl_2] complex recycled from 11/20/23
set ① & set ② ⇒ ~~Mn(Bn, Me, Bn, Me, Mn~~ ~~(BMM)~~

set ① ⇒ 10 ml MB + 10 ml pond water + resin-complex (recycled fr
11/20/23 set ①) → pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker (150 rpm)
Current cycle is 4th cycle.

set ② ⇒ 10 ml MB + 10 ml Tap water + resin-complex (recycled
from 11/20/23 set ②) → pH 7 → 25 ml → add 0.25 ml H_2O_2
→ shaker (150 rpm)
Current cycle is 5th cycle.

	set ① (pond w.)	set ② (tap w.)
10:30 am A_0 →	0.861, 0.564	0.939, 0.619
140 min 12:50 pm →	0.642, 0.405	0.784, 0.505
258 min 2:50 pm →	0.544, 0.342	0.699, 0.454
376 min 4:50 pm →	0.482, 0.304	0.640, 0.411
11/28/23 1421 min 10:15 am →	0.221, 0.134	0.329, 0.205
1626 min 1:40 pm →	0.195, 0.122	0.298, 0.186
11/29/23 2886 min 10:40 am →	0.108, 0.068	0.155, 0.099
3101 min 2:15 pm →	0.102, 0.068	0.141, 0.094
11/30/23 4346 min 11:00 am →	0.082, 0.059	0.099, 0.086

No ppt.

11/30/23

Dye bleaching of (MB) using resin-Mn [(Bn, Me, Bcyclam)Cl_2] complex recycled from 11/27/23 ⇒ $[Mn(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml (pond) water + resin-catalyst (recycled from 11/27/23 set ①) ⟶ pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker

(5th) cycle

set ①

12:10 pm ⇒ A = 0.860, 0.621

230 min

4:00 pm ⇒ 0.719, 0.503

(12/1/23)

~~1280 min~~

9:30 am ⇒ 0.491, 0.368

~~1340 min~~

10:30 am ⇒ 0.484, 0.367

(12/4/23)

2770 min

10:20 am ⇒ 0.267, 0.198

(12/5/23)

4:30 pm ⇒ 0.230, 0.187

(12/6/23)

9:30 am ⇒ 0.221, 0.189

(12/8/23)

1:00 pm ⇒ 0.193, 0.165

(12/11/23)

8:30 am ⇒ 0.179, 0.168

11/28/23 Dye bleaching of (MB) using resin-Fe [(Bn, Me, Cl_2)] complex ~~was~~ using fresh sample catal. prepared on 11/27/23 ⇒ $[Fe(2)]^{2+}$.

Set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex → pH 7 → 25 m
→ 0.25 ml H_2O_2 → shaker (150 rpm), (1st) cycle

Set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex → pH 7 → 25 m
→ 0.25 ml H_2O_2 → shaker (150 rpm), (1st) cycle

Set ③ ⇒ 10 ml MB + 10 ml H_2O + resin-complex → pH 7 → 25 ml
→ NO H_2O_2 → shaker (150 rpm), (1st) cycle

	set ①	set ②	NO H_2O_2 set ③ NO +
10:00 am			
A_0 ⇒	0.856, 0.576	0.875, 0.578	0.699, 0.446
42 min			
10:42 am →	0.597, 0.396	0.561, 0.362	0.546, 0.357
80 min			
11:22 am →	0.432, 0.302	0.417, 0.280	0.437, 0.272
131 min			
12:15 pm →	0.297, 0.215	0.270, 0.190	0.317, 0.195
194 min			
1:20 pm →	0.142, 0.099	0.114, 0.080	0.210, 0.125
222 min			
1:50 pm →	0.090, 0.073	0.064, 0.054	0.163, 0.098
250 min			
2:20 pm →	0.060, 0.055	0.038, 0.037	0.124, 0.072
293 min			
3:05 pm →	⊗.		0.076, 0.045
11/29/23			
1368 min			
9:00 am →	0.022, 0.059	0.010, 0.051	0.023, 0.015
(did not stir since 3:05 pm, 11/28)			looked much cleaner (w/o any blackish

11/29/23

Dye bleaching of (MB) using resin-Fe[(Bn, Me, Bcyclam)Cl$_2$] complex ~~using~~ ~~from~~ catalyst recycled from 11/28/23 ⇒ $[Fe(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex (recycled from 11/28/23 set ①) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

(2nd) cycle

set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex (recycled from 11/28/23 set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

(2nd cycle)

set ③ ⇒ NO H_2O_2 → (2nd) cycle

	set ①	set ②	set ③ NO H_2O_2
10:15 am A ⇒	0.819, 0.556	0.820, 0.561	0.881, 0.593
40 min 10:55 am ⇒	0.744, 0.519	0.649, 0.435	0.755, 0.517
158 min 12:56 pm ⇒	0.639, 0.434	0.436, 0.280	0.556, 0.363
216 min 1:55 pm ⇒	0.600, 0.411	0.368, 0.238	0.487, 0.311
304 min 3:25 pm ⇒	0.536, 0.370	0.273, 0.177	0.401, 0.251
387 min 4:50 pm ⇒	0.478, 0.338	0.192, 0.125	0.321, 0.205
11/30/23			
1355 min 9:00 am ⇒	0.014, 0.039	0.009, 0.060	0.011, 0.006
	pH ~~resin~~ was 8.53 before adjusted to 7	pH was 7.54 before adjusted to 7	pH was 7.11, didn't have to adjust

11/30/23 Dye bleaching of (MB) using resin – Fe [(Bn, Me Bcyclam) Cl_2] complex catalyst recycled fr

11/29/23 ⇒ $[Fe(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml H_2O + resin-catalyst (recycled f 11/29 set ①) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaken (3rd) cycle

set ② ⇒ 10 ml MB + 10 ml H_2O + resin-catalyst (recycl from 11/29 set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → sha (3rd) cycle

set ③ ⇒ NO H_2O_2, (3rd) cycle

	Set ①	set ②	NO H_2O_2 set ③	N H
10:37 am A_0 ⇒ (60 min)	0.838, 0.591	0.832, 0.583	0.916, 0.645	
11:37 am ⇒ (118 min)	0.759, 0.551	0.685, 0.472	0.822, 0.583	
12:37 pm ⇒ (183 min)	0.705, 0.504	0.606, 0.423	0.760, 0.525	
1:44 pm ⇒ (257 min)	0.649, 0.465	0.522, 0.356	0.695, 0.470	
3:00 pm ⇒ (315 min)	0.578, 0.427	0.444, 0.306	0.636, 0.441	
4:00 pm ⇒	0.516, 0.378	0.365, 0.272	0.588, 0.407	
12/1/23				
9:30 am ⇒ (1363 min)	0.030, 0.158	0.024, 0.151	0.098, 0.063	
	little floating black particles observed while filtering & washing	more particles ⇒ in set ②, less particles in set ①	10:30 am ⇒ 0.088, 0.0	
	broken resin? MB? impurity?			

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12/4/23 Dye bleaching of (MB) using resin – Fe [(Bn, Me, Bcyclam)Cl2] complex recycled from 11/30/23 ⇒ [Fe(2)]2+

set ① ⇒ (10) ml MB + 10 ml H_2O + resin-complex (recycled from 11/30/23 set ①) → pH 7 → 25 ml → add 0.25 ml H_2O_2 → shaker
(4th cycle), (diluted) ~~conc.~~

set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex (recycled from 11/30/23 set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker
(4th cycle), (diluted) conc.

set ③ ⇒ 10 ml MB + 10 ml H_2O + resin-complex (11/30, set ③) → pH → 25 ml → NO H_2O_2 → shaker. (4th) cycle

	set ①	set ②	set ③ NO H_2O_2
9:50 am ⇒ A₀	0.393, 0.294	0.344, 0.248	0.861, 0.739
55 min 10:45 am ⇒	0.129,	0.100, 0.083	0.783, 0.632
148 min 12:20 pm ⇒	0.046	0.031	0.668, 0.542
231 min 1:55 pm ⇒			0.616, 0.477
~30 min 334 min (3:16 pm)	A₀ low as dyes ppt out		
3:40 pm			0.556, 0.439
412 min 5:00 pm ⇒			0.517, 0.406
(12/5/23)			
1432 min 10:00 am ⇒			0.215, 0.135
1630 min 1:20 pm ⇒			0.136, 0.094
1758 min 3:30 pm ⇒			0.107, 0.081
1816 min 4:30 pm ⇒			0.095, 0.074
(12/6/23)			
2836 min 9:30 am ⇒			0.030, 0.029

12/4/23

Dye bleaching of MB using resin - Fe [(Bpy, Me, Bcyclam) Cl_2] complex recycled from 12/4/23 1st & 2nd set ⇒ $[Fe(2)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ①) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

5th cycle

set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

5th cycle

	Set ① 5th cycle	set ② 5th cycle
1:25 pm A_o ⇒	0.757, 0.660	0.811, 0.711
40 min 2:05 pm ⇒	0.466, 0.373	0.481, 0.377
73 min 2:40 pm ⇒	0.355, 0.277	0.328, 0.249
~30 min 101 min 3:40 pm (3:10 pm) ⇒	0.244, 0.194	0.197, 0.160
129 min 4:10 pm ⇒	0.194, 0.151	0.135, 0.110
167 min 5:00 pm ⇒	0.118, 0.100	0.057, 0.061
12/5/23 118 min 10:00 am ⇒	0.043, 0.323	0.038, 0.290

Again saw a lot of bluish black floating particles while filtering.

12/5/23 Dye bleaching of (MB) using resin – [(Bn, Me, Bcyclam)Cl2] complex recycled from 12/4/23 ⇒ $[Fe(2)]^{2+}$

Set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker, (6th) cycle

Set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker, (6th) cycle

Dye is precipitating out, that's why low abso.

	Set ①	Set ②
12:15pm A_o →	0.428, 0.346	0.328, 0.261
1:20pm →	0.095, 0.095	0.055, 0.054
1:50pm →	0.041,	0.025
	Dyes ppt out, so absorbance drops down quick.	(floating blueish black particles observed. Probably MB ppt. out or broken resins ??)

12/11/23

Dye bleaching of (MB) using resin-Fe[(CBn, Me, Bcyclam)Cl$_2$] catalyst recycled from 12/4/23 set ③ ⇒ [Fe(2)]$^{2+}$

set ③ 10 ml MB + 10 ml H_2O + resin-complex (recycled from 12/4/23 set ③) → PH 7 → 25 ml → NO H_2O_2 → shaker

(5th cycle)

time		Abs (set 3)
10:22 am A_0 ⇒	10:22 am	0.869, 0.952
	123 min 12:25 pm	0.730,
	183 min 1:27 pm	0.687, 0.702
	−3 min 240 min 2:27 pm	0.661, 0.682
	−4 min 297 min 3:28 pm	0.615, 0.609
	−12 min 357 min 4:40 pm	0.568, 0.536
(12/12/23)	1367 min 9:30 am	0.300, 0.295
	1787 min 4:30 pm	0.242, 0.223
(12/13/23)	2267 min 12:30 pm	0.116, 0.107
	2507 min 4:30 pm	0.105, 0.107
(12/14/23)	3527 min 9:30 am	0.068, 0.072

12/7/23 Dye bleaching of RhB using resin – Fe

** [(Bn, Me, Bcyclam) Cl_2] complex from 12/6/23

~~BMF~~ $[Fe(2)]^{2+}$

Set ① ⇒ 10 ml RhB + 10 ml H_2O + resin – complex (from 12/6/23 :
→ pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker, 1st cyc

set ② ⇒ 10 ml RhB + 10 ml H_2O + resin – complex (from 12/6/23 :
②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker, 1st cycle

set ③ ⇒ 10 ml RhB + 10 ml H_2O + resin – complex
(from 12/6/23 set ③) → pH 7 → 25 ml → NO H_2O_2 → sha
1st cycle

	set ①	set ②	set ③ NO H_2O_2
10:18am A_0 ⇒	0.908 (553 nm)	1.020 (553 nm)	0.954 (553 nm)
42 min 11:00am ⇒	0.685	0.717	0.932
-5 min 82 min 11:45am ⇒	0.557	0.578	
120 min 12:25 pm ⇒	0.470	0.453	0.863
186 min -4 min 1:35 pm ⇒	0.343	0.322	0.846
-3 min 246 min 2:38 pm ⇒	0.253	0.223	0.821
-3 min 306 min 3:41 pm ⇒	0.178	0.166	0.803
-3 min 372 min 4:50 pm ⇒	0.129	0.120	0.810
12/8/23 1355 min			
9:15am ⇒	0.027	0.025	0.742
1:00 pm ⇒			0.719
12/11/23			
8:30am ⇒			0.715

12/11/23 Dye bleaching of (RhB) using resin-Fe [(Bn, Bcyclam)Cl_2] catalyst recycled from 12/7/2

$[Fe(2)]^{2+}$

set ① ⇒ 10 ml RhB + 10 ml H_2O ⇒ resin-complex (recycled fro 12/7/23 set ①) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shaker

2nd cycle

set ② ⇒ same as set ①, resin-complex (recycled fro 12/7/23 set ②) → pH 7 → 25 ml → 0.25 ml H_2O_2 → shak

2nd cycle

set ③ ⇒ same as set ① & ②, ~~set~~ 2nd cycle over 1st cycle in H_2O_2

	set ①	set ②	set ③
10:05 am A_0 →	1.054	0.998	1.001
40 min			
10:45 am →	0.913	0.819	0.762
-3 min 137 min			
12:25 pm →	0.823	0.710	0.499
-3 min 196 min			
1:27 pm →	0.763	0.629	0.374
-3 min 253 min			
2:27 pm →	0.710	0.554	0.289
-4 min 310 min			
3:28 pm →	0.671	0.474	0.215
-12 min 370 min			
4:40 pm →	0.599	0.385	0.160
12/12/23 1320 min			
9:30 am →	0.130	0.054	0.047

12/12/23 Dye bleaching of (RhB) using resin - Fe[(Bn, Bcyclam)Cl2] catalyst recycled from 12/11/23

[Fe(2)]$^{2+}$

Set ① ⇒ 10 ml RhB + 10 ml water + resin - complex (set ①) → pH 7 → 25 ml

(3rd) cycle

shaker ← 0.25 ml H_2O_2

Set ② ⇒ 10 ml RhB + 10 ml water + resin - complex (set ②) → pH 7 → 25 ml ↓

(3rd) cycle

shaker ← 0.25 ml H_2O

Set ③ ⇒ 10 ml RhB + 10 ml water + resin - complex (set ③) → pH 7 → 25 ml ↓

(3rd) cycle overall, (2nd) cycle w H_2O_2

shaker ← 0.25 ml H_2O_2

	Set ①	set ②	set ③
11:48 am A_o ⇒	1.067	0.958	0.862
57 min			
12:45 pm ⇒	0.808	0.827	0.581
−3 min 114 min			
1:45 pm ⇒	0.721	0.749	0.456
−3 min 171 min			
2:45 pm ⇒	0.662	0.696	0.359
−3 min 228 min			
3:45 pm ⇒	0.589	0.634	0.285
−3 min 285 min			
4:45 pm ⇒	0.504	0.551	0.233
(12/13/23) 1290 min			
9:30 am ⇒	0.044	0.059	0.052

12/13/23

Dye bleaching of (RhB) using resin-Fe [(Bn, Me, Beyclam) Cl_2] catalyst recycled from 12/12/23 ⇒

$[Fe(2)]^{2+}$

set ① ⇒ 10 ml RhB + 10 ml water + resin-complex (set-①) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(4th) cycle

set ② ⇒ 10 ml RhB + 10 ml water + resin-complex (set-②) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(4th) cycle

set ③ ⇒ 10 ml RhB + 10 ml water + resin-complex (set-③) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(4th) cycle overall,

(3rd) cycle with H_2O_2. [took lot of time to adjust pH to 7, compared to others]

	set ①	set ②	set ③
11:26 am A_0 ⇒	0.946	1.032	0.865
40 min 12:06 pm ⇒	0.643	0.907	0.868
-2 min 78 min 12:46 pm ⇒	0.532	0.892	0.903
-3 min 164 min 2:15 pm ⇒	0.352	0.784	0.921
-2 min 207 min 3:00 pm ⇒	0.296	0.737	
-1 min 251 min 3:45 pm ⇒	0.244	0.675	0.864
-2 min 309 min 4:45 pm ⇒	0.199	0.602	0.807
12/14/23 1294 min 9:10 am ⇒	0.036	0.070	0.162

12/14/23 Dye bleaching of (RhB) using resin-Fe[(Bn Bcyclam)Cl_2] catalyst recycled from 12/13/23

$[Fe(2)]^{2+}$

Set ① ⇒ 10 ml RhB + 10 ml water + (set-①) resin-complex → pH 7 → 25 m
(5th) cycle
shaker ← 0.25 ml H_2O_2

Set ② ⇒ 10 ml RhB + 10 ml water + (set-②) resin-complex → pH 7 → 25 m
(5th) cycle
shaker ← 0.25 ml H_2O_2

Set ③ ⇒ 10 ml RhB + 10 ml water + (set-③) resin-complex → pH 7 → 25
(5th) cycle overall,
(4th) cycle with H_2O_2.
shaker ← 0.25 ml H_2O_2

	Set ①	set ②	set ③
10:46 am A_o ⇒	0.942	1.018	1.000
117 min			
12:43 pm ⇒	0.778	1.000	0.984
-2 min 192 min			
2:00 pm ⇒	0.740	0.967	0.952
-2 min 250 min			
3:00 pm ⇒	0.699	0.890	0.881
-3 min 322 min			
4:15 pm ⇒	0.647	0.845	0.814
(12/15/23) 1387 min			
10:00 am ⇒	0.118	0.142	0.147

1/17/24 **

Dye bleaching of (MO) using Allyl, Bn, [MnCl$_2$] - resin from 1/16/24 ⇒ Allyl, Bn, Mn[Begdam]Cl$_2$

Set ① ⇒ 10 ml MO + 10 ml water + $[Mn(3)]^{2+}$ (set ①) resin-complex → pH 7 → 25 m
(1st) cycle
shaker ← 0.25 ml H_2O

Set ② ⇒ 10 ml MO + 10 ml water + (set ②) resin-complex → pH 7 → 25
(1st) cycle
shaker ← 0.25 ml H_2O_2

Set ③ ⇒ 10 ml MO + 10 ml water + (set ③) resin-complex → pH 7 →
(1st) cycle
shaker ← NO H_2O

	set ①	set ②	NO H_2O_2 set ③
10:15 am			
A_o ⇒	0.491 (461 nm)	0.487 (461 nm)	0.471 (461 nm
28 min			
10:43 am ⇒	0.204	0.140	0.471
-3 min, 42 min			
11:00 am ⇒	0.090	0.070	
-1 min, 61 min			
11:20 am ⇒	0.047	0.042	0.471.

(Data saved as 1-16-24 in UV-Vis comp.)

1/18/24

Dye bleaching of (MO) using Allyl, Bn, [Mn(Bcyclam)Cl$_2$] – resin catalyst recycled from 1/17/24

[Mn(3)]$^{2+}$

Set ① ⇒ 10 ml MO + 10 ml water + resin-complex (set ① – recycled) → pH 7 → 25 ml
↓
shaker ← 0.25 ml H_2O_2
(2nd) cycle.

Set ② ⇒ 10 ml MO + 10 ml water + resin-complex (set ② – recycled) → pH 7 → 25 ml
↓
shaker ← 0.25 ml H_2O_2
(2nd) cycle.

Set ③ ⇒ 10 ml MO + 10 ml water + resin-complex (set ③ – recycled) → pH 7 → 25 ml
↓
shaker ← 0.25 ml H_2O_2
(2nd) cycle | (1st) cycle ω H_2O_2

	Set ①	Set ②	Set ③
9:56 am A_0 ⇒	0.498 (461 nm)	0.481	0.472
20 min			
10:16 am ⇒			0.134
35 min			
10:31 am ⇒	0.409	0.421	0.054
57 min			
10:55 am ⇒	0.365	0.359	0.034
93 min			
12:43 pm ⇒	0.238	0.232	
161 min			
1:53 pm ⇒	0.198	0.197	
289 min			
4:03 pm ⇒	0.145	0.138	
1/19/24	1321 min		
9:15 am ⇒	0.066, (a new peak at 324 nm, 0.152)	0.060, (a new peak at 325 nm, 0.164)	

1/23/24 Dye bleaching of (MO) using Allyl, Bn, [Mn(Bi
Cl$_2$] - resin recycled from 1/18/24 ⇒

$[Mn(3)]^{2+}$

set ① ⇒ 10 ml MO + 10 ml water + resin-complex (set ① - recycled) → pH 7 → 25
(3rd) cycle ↓
shaker ← 0.25 ml H_2

set ② ⇒ 10 ml MO + 10 ml water + resin-complex (set ② - recycled) → pH 7 → 2
(3rd) cycle, ↓
shaker ← 0.25 ml H_2

set ③ ⇒ 10 ml MO + 10 ml water + resin-complex (set ③ - recycled) → pH 7 → ;
(3rd) cycle | (2nd) cycle ↓
ω H_2O_2 shaker ← 0.25 ml H

	set ①	set ②	set ③
10:23 am			
A_o →	0.478 (461 nm)	0.481 (461 nm)	0.457 (461 nm)
82 min			
11:45 am →	0.485	0.47●5	0.371
-3 min 198 min			
1:44 pm →	0.477	0.463	0.301
-2 min 340 min			
4:08 pm →	0.468	0.462	0.267
(1/24/24) 1362 min			
9:10 am →	0.430	0.421	0.193
(1/25/24) 3242 min			
4:30 pm →	0.363	0.361	0.165
(1/26/24)			
4:30 pm →	0.330	0.315	0.154
(1/31/24)			
12:30 pm →	0.230	0.262	0.117

(140)

1/25/24 **

Dye bleaching of (MB) using Allyl, Bn, [Mn(B cyclam)Cl_2] - resin catalyst from 1/24/24 ⇒

Set ① ⇒ 10 ml MB + 10 ml water + resin-complex (set ①) → PH 7 ↓ 25 ml
$[Mn(3)]^{2+}$
(1st) cycle shaker ← 0.25 ml H_2O_2

Set ② ⇒ 10 ml MB + 10 ml water + resin-complex (set-②) → PH 7 → 25 ↓
(1st) cycle shaker ← 0.25 ml H_2O_2

Set ③ ⇒ 10 ml MB + 10 ml water + resin-complex (set-③) → PH 7 → 25 ↓
(1st) cycle shaker ← NO H_2O_2

	Set ①	Set ②	Set ③ (NO H_2O_2
10:02 am A_0 ⇒	0.855 (664 nm),	0.787 (664 nm)	0.801 (664 nm)
24 min	0.898 (290 nm)	1.058 (290 nm)	1.011 (290 nm)
10:26 am → 57 min	0.485, 0.583	0.512, 0.654	0.652, 0.777
-2 min 11:01 am →	0.308, 0.377	0.313, 0.355	0.516, 0.553
-2 min 174 min 12:58 pm →	0.067, 0.077	0.052, 0.093	0.254, 0.222
386 min 4:30 pm →			0.029

1/26/24

Dye bleaching of (MB) using Allyl, Bn, [Mn (CBcyclam) Cl_2] – resin catalyst recycled from $[Mn(3)]^{2+}$ 1/25/24 ⇒

set ① ⇒ 10 ml MB + 10 ml water + resin – complex (set – ①) → PH 7 ↓ 25 ml H_2O_2 ← 0.25 ml shaker → (2nd) cycle

set ② ⇒ 10 ml MB + 10 ml water + resin – complex (set – ②) → PH 7 ↓ 25 ml H_2O_2 ← 0.25 ml shaker → (2nd) cycle

set ③ ⇒ 10 ml MB + 10 ml water + resin – complex (set – ③) → PH 7 ↓ 25 ml H_2O_2 ← 0.25 ml shaker → (2nd) cycle

(1st) cycle ∞ H_2O_2

	set ①	set ②	set ③
9:54 am	A ⇒ 0.739, 0.884	0.739, 0.937	0.807, 1.018
25 min			
10:19 am →	0.623, 0.802	0.627, 0.795	0.583, 0.802
2 min 62 min			
10:58 am →	0.535	0.541, 0.667	0.391, 0.472
2 min 83 min			
1:21 pm →	0.292, 0.301	0.305, 0.307	0.194, 0.231
2 min 141 min			
2:21 pm →	0.213, 0.212	0.229, 0.253	0.156, 0.203
2 min 223 min			
3:45 pm →	0.126,	0.138, 0.137	0.109, 0.162
3 min 279 min			
4:46 pm →	0.077, 0.091	0.087, 0.106	0.075, 0.111

1/30/24 Dye bleaching of (MB) using Allyl, Bn, [Mn(Bpy
-resin catalyst recycled from 1/26/24 → Cl_2

$[Mn(3)]^{2+}$

Set ① ⇒ 10 ml MB + 10 ml water + resin-complex (recycled - set ①) → pH 7 → 25 ml
(3rd) cycle shaker ← 0.25 ml H_2

Set ② ⇒ 10 ml MB + 10 ml water + resin-complex (recycled - set ②) → pH 7 → 25 ml
(3rd) cycle shaker ← 0.25 ml H_2O_2

Set ③ ⇒ 10 ml MB + 10 ml water + resin-complex (recycled - set ③) → pH 7 → 25 m
(3rd) cycle / (2nd) cycle w H_2O_2 shaker ← 0.25 ml H_2O

	Set ①	Set ②	Set ③
10:03 am A₀ ⇒	0.819 (664 nm), 1.018 (290 nm)	0.911, 1.081	0.921, 1.115
45 min			
10:48 am ⇒	0.660, 0.748	0.775, 0.985	0.860, 1.029
3 min 89 min			
1:15 pm ⇒	0.429, 0.443	0.599, 0.638	0.772, 0.927
4 min 382 min			
4:32 pm ⇒	0.203, 0.198	0.368, 0.360	0.630, 0.696
4 min			
1/31/24 1578 min			
12:30 pm ⇒	0.018, 0.031	0.016, 0.017	0.110, 0.114

2/2/24 Dye bleaching of (MB) using Allyl, Bn, [Mn (Beyclam) Cl_2] – resin catalyst recycled from 1/30/24 ⇒ $[Mn(3)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml water + resin-complex (recycled – set ①) → pH 7 → 25 ml
(4th) cycle
shaker ← 0.25 ml H_2O_2

set ② ⇒ 10 ml MB + 10 ml water + resin-complex (recycled – set ②) → pH 7 → 25 ml
(4th) cycle
shaker ← 0.25 ml H_2O_2

set ③ ⇒ 10 ml MB + 10 ml water + resin-complex (recycled – set ③) → pH 7 → 25 ml
(4th) cycle | (3rd) cycle w H_2O_2
shaker ← 0.25 ml H_2O_2

	set ① (664 nm) (290 nm)	set ②	set ③
1:52 pm A ⇒	0.837, 1.001	0.877, 1.051	0.996, 1.187
53 min 2:45 pm ⇒	0.757, 0.864	0.781, 0.911	0.905, 1.140
-2 min 123 min 3:57 pm ⇒	0.687, 0.768	0.709, 0.765	0.904, 1.119
-2 min 160 min 4:36 pm ⇒	0.647, 0.691	0.675, 0.757	
-2 min 224 min 5:42 pm ⇒	0.581, 0.605	0.624, 0.616	0.859, 1.10
2/5/24			
142 min 9:00 am ⇒	0.017, 0.024	0.018, 0.029	0.102, 0.094
2/14/24			
2612 min 9:30 am ⇒			0.018, 0.024

2/9/24 Dye bleaching of (MB) using Allyl, Bn, [Mn (Bcyclam) Cl2]. - resin catalyst recycled [Mn(3)]$^{2+}$ from 2/2/24 ⇒ (5th cycle)

Set ① ⇒ 10 ml MB + 10 ml water + (recycled - set ①) resin - complex → pH 7 → shaker ← 0.25 ml H_2O_2 ← 25 ml

(5th) cycle

Set ② ⇒ 10 ml MB + 10 ml water + (recycled - set ②) resin - complex → pH 7 → shaker ← 0.25 ml H_2O_2 ← 25 ml

(5th) cycle

Set ③ ⇒ 10 ml MB + 10 ml water + (recycled - set ③) resin - complex → pH 7 → shaker ← 0.25 ml H_2O_2 ← 25 ml

(5th cycle) (4th cycle ∞ H_2O_2)

	Set ① (664 nm) (290 nm)	Set ②	Set ③
9:47 am A_o ⇒	0.953, 1.164	0.949, 1.133	0.975, 1.160
60 min → 10:47 am →	0.868, 1.055	0.840, 1.057	0.921, 1.079
200 min (-3 min) → 1:10 pm →	0.748, 0.868	0.691, 0.764	1.067, 1.125
293 min (-2 min) → 2:45 pm →	0.691, 0.765	0.616, 0.615	0.846, 1.064
410 min (-3 min) → 4:45 pm →	0.612, 0.619	0.533, 0.495	0.795, 0.835
2/12/24			
1415 min → 9:30 am →	0.028, 0.029	0.017, 0.014	0.266, 0.224

3/28/2024 Dye bleaching of (RhB) using Allyl, Bn, [Mn (B.cyclam)Cl_2] -resin catalyst recycled from 2/16/24 → $[Mn(3)]^{2+}$

set ① → 10 ml RhB + 10 ml water + resin complex (set ①) → pH 7 ↓
(1st) cycle shaker ← 0.25 ml H_2O_2 ← 25 ml

set ② → 10 ml RhB + 10 ml water + resin-complex (set ②) → pH 7 ↓
(1st) cycle shaker ← 0.25 ml H_2O_2 ← 25 ml

set ③ → 10 ml RhB + 10 ml water + resin-complex (set ③) → pH7 ↓
(1st) cycle, NO H_2O_2 shaker ← H_2O_2 NO (NO H_2O_2)

	set ①	set ②	set ③
10:20 am A_o →	1.102 (553 nm)	1.080 (553 nm)	1.024 (553 nm)
10:41 am →	0.955	0.982	1.000
-3 min 11:10 am →	0.819	0.876	0.974
-3 min. 12:02 pm →	0.603	0.708	0.960
-3 min 1:24 pm →	0.434	0.535	0.917
-3 min 4:33 pm →	0.284	0.411	0.852
-3 min			
3/29/24			
9:22 am →	0.099	0.268	0.799
-3 min 12:02 pm →	0.087	0.261	0.780
4/1/24			
8:50 am →	0.024	0.115	0.772

4/1/24 Dye bleaching of (RhB) using Allyl, Bn, $(Mn(3))^{2+}$ [Mn(Bcyclam)Cl_2] - resin catalyst recycled from 4/1/2024 →

Set ① → 10 ml RhB + 10 ml water + resin - complex (set ①) → shaker ← 0.25 ml H_2O_2 ← 25 ml ← PH 7

(2nd) cycle

Set ② → 10 ml RhB + 10 ml water + resin - complex (set - ②) → PH 7 → shaker ← 0.25 ml H_2O_2 ← 25 ml

(2nd) cycle

Set ③ → 10 ml RhB + 10 ml water + resin - complex (set - ③) → PH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(2nd) cycle, (1st) cycle (ω H_2O_2)

	set ①	set ②	set ③
A_0 11:17 am →	0.969	1.044	1.094
1:48 pm →	1.000	0.996	0.534
5/1/24			
9:15 am →	0.908	0.847	0.041
1:15 pm →	0.900	0.864	0.032
4:05 pm →	0.916	0.834	
6/1/24 9:45 am →	0.900	0.834	0.021
7/1/24			
2:40 pm →	0.849	0.765	0.014
5/1/24			
11:15 am →	0.804	0.742	0.017
4/8/24 11:15 am →	0.747	0.813	0.023
4/12/24			
9:25 am →	0.666	0.557	0.010

4/8/24 ~~Ionic binding~~ Degradation of (MB)

(4/8/24) using $Mn_2[Mn(Bcyclam)Cl_2]PF_6$ – resin catalyst

$[Mn(I)]^{2+}$

set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ①) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

1st cycle

set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ②) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

1st cycle

set ③ ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ③) → pH 7 → 25 ml → shaker ← NO H_2O_2

1st cycle

	set ①		set ②		NO H_2O_2 set ③	
	(664 nm)	(290 nm)	(664 nm)	(290 nm)	(664 nm)	(290 nm)
10:26 am A_o ⇒	0.827	0.891	0.819	0.836	0.814	0.869
11:38 am ⇒	0.496	0.419	0.487	0.423	0.479	0.417
2:07 PM (−2 mon) ⇒	0.189	0.157	0.167	0.138	0.201	0.163
3:14 pm (−3 mon) ⇒	0.087	0.084	0.080	0.074	0.123	0.085
9/1/24						
9:00 am ⇒	0.001	0.036	0.004	0.050	0.003	0.005
[redacted] ⇒						

4/9/24 (4/9/24) Degradation of (MB) using Me_2[Mn(Bcyclam)C... PF_6 - resin catalyst recycled from 4/8/24

$[Mn(1)]^{2+}$ (2nd cy...

set ① ⇒ 10 ml MB + 10 ml H_2O ~~dye~~ + resin - complex (set ①) → pH 7 → 25 m... → 0.25 ml H_2... → shaker
(2nd) cycle

set ② ⇒ 10 ml MB + 10 ml H_2O ~~dye~~ + resin - complex (set ②) → pH 7 → 25 ml → 0.25 ml H_2O... → shaker
(2nd) cycle

set ③ ⇒ 10 ml MB + 10 ml H_2O ~~dye~~ + resin - complex (set ③) → pH 7 → 25 ml → NO H_2O_2 → shaker
(2nd) cycle

	set ① (664 nm) (290 nm)	set ② (664 nm) (290 nm)	NO H_2O_2 set ③
A_0 10:41 am →	0.884, 0.946	0.799, 0.807	0.801, 0.814
− 20 min 12:00 pm →	0.663, 0.637	0.626, 0.583	0.659, 0.597
− 3 min 1:38 pm →	0.498, 0.436	0.462, 0.425	0.462, 0.384
− 3 min 7:02 pm →	0.183, 0.160	0.151, 0.127	0.184, 0.145
4/10/24			
9:00 am →	0.014, 0.013	0.009, 0.011	0.012, 0.005
~~4/10/24~~			
~~9:25 am~~			

4/10/24

Degradation of (MB) using $Me_2[Mn(Bcyclam)Cl_2]PF_6$-resin catalyst recycled from 4/9/24 ⇒

[Mn(I)] 3+ (3rd cycle)

set ① ⇒ 10 ml MB + 10 ml ~~dye~~ water + resin-complex (set ①) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(3rd) cycle

set ② ⇒ 10 ml MB + 10 ml ~~dye~~ H_2O + resin-complex (set ②) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(3rd) cycle

set ③ ⇒ 10 ml MB + 10 ml ~~dye~~ H_2O + resin-complex (set ③) → pH 7 → 25 ml → shaker ← NO H_2O_2

(3rd) cycle

	set ①	set ②	set ③ NO H_2O_2
10:41 am ⇒ A_o	0.862, 0.899	0.880, 0.922	0.858, 0.897
11:49 am ⇒	0.796, 0.830	0.818, 0.841	0.714, 0.690
8:30 pm ⇒	0.570, 0.564	0.521, 0.457	0.409, 0.346
(4/11/24)			
9:00 am ⇒	0.403, 0.336	0.288, 0.239	0.161, 0.109
11:55 am →	0.362, 0.307	0.238, 0.195	0.114, 0.076
5:15 pm →	0.291	0.168	0.057
(4/12/24)			
9:25 am →	0.124	0.017	0.009
(4/15/24)			
9:15 am →	0.009		

4/15/24

Degradation of (MB) using $Me_2[Mn(Bcyclam)Cl_2]PF_6$-resin catalyst recycled from 4/10/24 (4th cycle)

$[Mn(I)]^{3+}$

set ① ⇒ 10 ml MB + 10 ml H_2O + (set①) resin-complex → pH 7 → 25 ml shaker ← 0.25 ml H_2O_2 ↓

(4th) cycle

set ② ⇒ 10 ml MB + 10 ml H_2O + (set②) resin-complex → pH 7 → 25 ml shaker ← 0.25 ml H_2O_2 ↓

(4th) cycle

set ③ ⇒ 10 ml MB + 10 ml H_2O + (set③) resin-complex → pH 7 → 25 ml shaker ← NO H_2O_2 ← NO H_2O_2 NO H_2O_2

(4th) cycle

	set ① (664 nm)	(290 nm)	set ②	set ③
10:24 am A_o ⇒	0.930,	0.975	0.901, 0.903	0.831, 0.840
11:49 am −9 min ⇒	0.872,	0.858	0.857, 0.894	0.747, 0.733
2:20 pm ⇒	0.790,	0.765	0.782, 0.735	0.586, 0.503
−5 min				
4/16/24				
9:20 am ⇒	0.551,	0.472	0.421, 0.348	0.221, 0.164
11:50 am ⇒	0.512,	0.451	0.375, 0.296	0.168, 0.122
4/17/24				
9:05 am ⇒	0.291,	0.223	0.122, 0.088	0.040, 0.027
11:46 am ⇒	0.258,	0.202	0.090, 0.070	
4:50 pm ⇒	0.217		0.050	
4/18/24				
9:10 am ⇒	0.090		0.002	

4/17/24
4/17/24

Degradation of MB using $Me_2[Mn(Bcycla\ Cl_2]PF_6$ - resin catalyst recycled from 4/15/24 ⇒

$[Mn(1)]^{3+}$

set ③ ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ③)

shaker ← NO H_2O_2 ← 25 ml ← pH 7

5th cycle

set ③		Absorbance (664.5 nm)	(290 nm)
9:55 am, A_0	→	0.836,	0.832
11:46 am	→	0.834,	0.823
4:50 pm	→	0.726,	0.692
4/18/24 9:10 am	→	0.481,	0.396
11:46 am	→	0.442,	0.355
4:50 pm	→	0.402,	0.317
4/19/24 10:00 am	→	0.263,	0.215
2:10 pm	→	0.228,	0.134
4/22/24 9:10 am	→	0.049,	0.040

4/18/24

Degradation of MB using $Me_2[Mn^{(I)}(CB_{cyclam})Cl_2]PF_6$-resin catalyst recycled from 4/15/24

Set ① ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ①) → pH 7 ↓ 25 ml H_2O_2 → 0.25 ml shaker

5th cycle

set ② ⇒ 10 ml MB + 10 ml H_2O + resin-complex (set ②) → pH 7 ↓ 25 ml H_2O_2 → 0.25 ml shaker

5th cycle

	set ① (664 nm)	(290 nm)	set ②
10:22 am A_0 ⇒	0.835,	0.803	0.851, 0.847
11:46 am ⇒	0.816,	0.806	0.845, 0.860
4:50 pm ⇒	0.771,	0.743	0.748, 0.700
4/19/24			
10:00 am ⇒	0.580,	0.511	0.496, 0.425
2:10 pm ⇒	0.541,	0.460	0.441, 0.360
4/22/24			
9:10 am ⇒	0.093,	0.081	0.022, 0.023

F_6 (Na)

4/23/24 Degradation of (RhB) using $Me_2[Mn(Bcyclam)Cl_2]PF_6$ - resin catalyst from 4/22/24 batch ⇒

$[Mn(I)]^{2+}$

set ① ⇒ 10 ml RhB + 10 ml H_2O + resin-catalyst (set-①) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(1st) cycle

set ② ⇒ 10 ml RhB + 10 ml H_2O + resin-catalyst (set-②) → pH 7 → 25 ml → shaker ← 0.25 ml H_2O_2

(1st) cycle

set ③ ⇒ 10 ml RhB + 10 ml H_2O + resin-catalyst (set-③) → pH 7 → 25 ml → shaker ← NO H_2O_2

(1st) cycle

for mins

	set ①	set ②	NO H_2O_2 set ③
10:01 am	A_o → 1.097 (553 nm)	1.346 (553 nm)	0.899
11:01 am →	0.937	0.975	0.914
-3 min 11:59 am →	0.878	0.904	0.794
-3 min 1:27 pm →	0.804	0.808	0.687
-3 min 3:57 pm →	0.711	0.725	0.599
(4/24/24) 9:10 am →	0.121, 0.266 (553 nm) ?? (502 nm)	0.629	0.405
solution color different, new peak appeared ??			
11:30 am →	0.077 (553 nm), 0.260 (560 nm)	0.615	0.433
4:10 pm →	0.037 (497 nm), 0.267 (553 nm)	0.622	0.419
(4/25/24) 9:10 am →	0.190, 0.006	0.590	0.390
3:30 pm →	0.144 (497), −0.0020	0.575	0.393
(4/26/24) 9:45 am →	0.127, 0.005	0.552	0.398
(4/29/24) 4:10 pm →	0.088, 0.002	0.512	0.385
(167) (5/3/24) 9:15 am →	0.078, 0.002	0.491	0.354

(72) The resin beads will be filtered off.

set ① → filtrate Rb tared wt → 85.214 g
tared wt of filter → 3.357 g (3.540 g)

set ② → filtrate Rb tared wt → 71.203 g
tared wt of filter → 3.222 g (3.396 g)

set ③ → filtrated Rb tared wt → 92.586 g
tared wt of filter → 3.378 g

9/18/23 ~~[Mn(II)]~~ (solid phase) ~~Bn, Me, Mn (BMM)~~
Dye bleaching expt (MO) (Use 150 rpm on shaker)

Set ① → 10 ml dye (MO) + 10 ml DI water + resin
(M-L) Mn complex → adjust pH → make up vol to 25 ml
→ add 0.25 ml H_2O_2 → place them on orbital shaker at 150 rpm, room temp.

set ② → same as Set ① (Cycle 1)
$[Mn(II)]^{3+}$

Set ③ → 10 ml dye (MO) + 10 ml DI water + resin-complex
→ adjust pH → make up to 25 ml (NO H_2O_2)

	set I	set ②	set ③ (Added catalyst after 35 min)
A_0 →	0.402 (468 nm)	0.412	0.412
5 min →	0.384		
10 min →	0.379		w/o H_2O_2
16 min →	0.375		
22 min →	0.370		
11:02 am 32 min →	0.361		
47 min 11:17 am →	0.351		
10:51 pm 140 min →	0.291	0.275	0.397
1:51 pm 200 min →	0.243	0.239	0.406

continued

9/20/23 (MO) Dye bleaching expt with resin-Mn-m ~~(Bn, Me, Mn) → BMM complex~~ III

complex recycled from 9/18/23 ⇒ $[Mn(1)]^{3+}$

(solid phase) (last run) 10:00 a

set ① → dye + complex + H_2O_2 (will be 2nd cycle f

current run → 10 ml MO + 10 ml H_2O

set ① Mn

+ resin-complex (recycled from 9/18/23 batc

2nd cycle → adjust pH to 7 → add 0.25 ml H_2O_2

MO $[Mn(1)]^{3+}$

set ② → dye + complex + H_2O_2 (will be 2nd cycle for this com

(last run)

current run →

2nd cycle 10 ml MO + 10 ml H_2O + resin-Mn complex set (

(recycled from 9/18/23 batch) → make up to

25 ml → adjust pH to 7 → add 0.25 ml H_2O_2

set ③ → dye + complex (no H_2O_2 last time) (will be 2nd cycle for this compl

current run → 1st cycle w̄ H_2O_2

2nd cycle 10 ml MO + 10 ml H_2O + resin-Mn complex set

1st cycle w̄ H_2O_2 ③ (recycled from 9/18/23 batch) → make up to

25 ml → adjust pH to 7 → add 0.25 ml H_2O_2

Continued to next page

	set ①	set ②	set ③
10:00 am A_0 →	0.412	0.396	0.402
60 min 11:00 am →	0.341	0.354	0.378
120 min 12:00 pm →	0.286	0.331	0.361
180 min 1:00 pm →	0.223	0.293	~~0.219~~ 0.348
240 min 2:00 pm →	0.175	0.261	~~0.348~~ 0.219

$[Mn(I)]^{3+}$	set (1) (MO)	set (2)	set (3)
A₀ → (9:54 am)	0.375	0.418	0.418
60 min 10:56 am →	0.317	0.396	0.388
120 min 11:55 am →	0.341	0.393	0.378
205 min 1:20 pm →	0.334	0.385	0.372
265 min 2:20 pm →	0.326	0.379	0.370
325 min 3:20 pm →	0.321	0.374	0.365
395 min 4:30 pm →	0.317	0.378	0.367
470 min 5:45 pm →	0.305	0.376	0.369
9/27/23			
9:30 am →	0.225	0.332	0.169
1415 min	3rd cycle ∞ H_2O_2	3rd cycle ∞ H_2O_2	3rd cycle / 2nd cycle ∞ H_2O_2

Molecular weight of Bn, Me, [Mn(Bcyclam)Cl₂]

= (330.52 + 35.45 + 35.45 + 54.94) amu

= 456.36 amu

250 mg resin = 0.00053125 mol Na sites (calculation → page 61)

In order to occupy 2% Na sites,

M-L complex needed → $0.00053125 \times \frac{2}{100}$ = mol

= 0.0000106 25 mol Na-sites

= $0.0000106 25 \times 456.36$ g

= 4.85×10^{-3} g = 4.85 mg

Thus, for 250 mg resin (Amberlite IRA-200C (Na), 4.85 mg of Bn, Me, [Mn (Bcyclam) Cl₂] complex is required, (for 2% site binding)

set ② → dye + complex + H_2O_2 (last run, did not do good)

Current cycle will be 4th run w̄ H_2O_2.

current run → 10 ml MO + 10 ml H_2O + resin-Mn complex (recycled from 9/26 set ②)

→ adjust pH to 7 → make up to 25 ml → add 0.25 ml H_2O_2 → shaker (1

$[Mn(1)]^{3+}$ ~~$[Mn(III)]^{2+}$~~

set ③ → dye + complex + H_2O_2 (last run, did OK) not good, no be

Current cycle will be 4th run (3rd run w̄ H_2

current run → 10 ml MO + 10 ml H_2O + resin-Mn complex (recycled from 9/26 set ③)

→ adjust pH to 7 → make up to 25 ml → add 0.25 ml H_2O_2 → shak (150

	Set ①	set ②	set ③
Ao 9:45am →	0.401	0.409	0.410
(80 min) 11:05am →	0.393	0.396	0.288
(220) 1:25 pm →	0.394	0.403	0.346
(330) 3:15 pm →	0.395	0.405	0.346
(480) 5:45 pm →	0.430	0.409	0.350
10/3/23 9:30 am →	0.385	0.400	0.349
(1425 min)	4th cycle	4th cycle	4th cycle / 3rd cycle w̄ H_2O_2

MO	Fe Set ①	Fe Set ②	Mn set ③	Mn set ④ MO
11:02 am				
A_0 →	0.431	0.419	0.416	0.420
11:07 am →	0.394	$[Fe(I)]^{3+}$	$Me_2[Mn(Beyclam)Cl_2]PF_6$	0.395
11:16 am →	0.393	1st cycle		0.391
11:37 am →	0.384	0.401	0.404	0.382 $[Mn(I)]^{3+}$
12:23 pm →	0.375	0.406	0.403	0.381
1:43 pm →	0.311	0.384	0.401	0.359 1st cycle
2:33 pm →	0.247	0.378	0.398	0.370
3:37 pm →	0.152	0.359	0.385	0.379
4:33 pm →	0.0892	0.342	0.393	0.377
5:33 pm →	0.031	0.298	0.393	0.383
10/6/23 →	0.00	0.00	0.393	0.377
9:30 am	(colorless)	(colorless)	Added	0.25 ml H_2O_2 more
After 7 days			0.353	after 7 days 0.028 (had less vol., might have evaporated)

$Me_2[Fe(Beyclam)Cl_2]PF_6$

10/6/23 (GTE06) Functionalization of Bn, Me, [Mn(Beyclam)Cl_2] complex with resin Amberlite IRA-200C (Na)

Calculation → page (80)

	Set ①	Set ②	Set ③
resin	0.2558 g	0.2564 g	0.2548 g
complex	0.0052 g	0.0053 g	0.0051 g
water	25 ml (pipette)	25 ml	25 ml

[Fe(I)]$^{3+}$ H_2O_2 (MO) added at 2:22 pm. cycle 2

[~~Fe(II)~~]$^{2+}$ ~~BHET~~

Set ① $A_0 \rightarrow 0.353$	Set ② $A_0 \rightarrow 0.393$	Set ③ $A_0 \rightarrow 0.394$
2:27 pm 0.369	0.369	0.388 w/o
2:29 pm 2:43 pm 0.355	0.356	0.383 H_2O_2
2:45 pm 3:03 pm 0.356	0.333	0.410
3:07 pm 3:46 pm 0.309	0.287	0.382
3:50 pm 4:30 pm 0.267	0.256	0.380
4:33 pm 5:15 pm 0.229	0.228	0.364
6:00 pm 0.196	0.201	0.364
9/15/23 9:04 am 0.012	0.045	0.187
10:15 am 0.008	0.073	0.172
2:10 pm 0.028 cycle 2	0.062 cycle 2	0.152 cycle 2 NO H_2O_2
	[Fe(I)]$^{3+}$	

9/15/23

Filtered them at this point. (9/14/23 batch)

Set ① Filter tared wt → 3.407 g

Set ② → 3.305 g

Set ③ → 3.305 g

$[Fe(I)]^{3+}$ MO	Set ①	Set ②	Set ③
10:55 am $A_0 \rightarrow$	0.403	0.403	0.406
60 min 11:55 am →	0.400	0.319	0.344
15 min 110 min 2:06 pm →	0.394	0.258	0.283
180 min 3:11 pm →	0.373	0.234	0.263
236 min 4:07 pm →	0.369	0.177	0.243
290 min 5:07 pm →	0.356	0.198	0.223
349 min 6:00 pm →	0.348	0.176	0.205
9/20/23 →	0.205	0.064	0.068
9:10 am 12 hr mon w/o H_2O_2			

cycle 3

cycle 3.

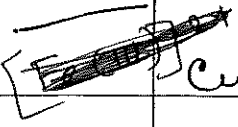
	$[Fe(I)]^{3+}$ tared wt.	$[Fe(I)]^{3+}$ final wt
Set ① →		
Set ② →	3.305 g	3.512 g
Set ③ →	3.305 g	3.484 g

Bn, Me, Fe complex (BMF)

MO

Set ③ → dye + Fe complex + H_2O_2 (last run) good in last run

~~Bm-Me-Fe (BMF)~~ complex



$[Fe(1)]^{3+}$

Current cycle will be (4th) run ω H_2O_2 using this resin-Fe complex.

current run → 10 ml MO + 10 ml H_2O + resin-Fe complex (recycled from 9/19, set ③)

→ adjust pH to 7 → make up to 25 ml → add 0.25 ml H_2O_2

4th cycle

	set ①	set ②	set ③
9:40 am A_0 →	0.431	0.411	0.425
10:50 am (70) →	0.387	0.399	0.417
12:50 pm (190) →	0.408	0.388	0.410
−15 min (250) 2:05 pm →	0.408	0.382	0.414
3:20 pm (325) →	0.402	0.366	0.407
4:40 pm (405) →	0.390	0.356	0.396
6:00 pm (485) →	0.384	0.319	0.391
9/26/23			
9:15 am →	0.240	0.093	0.188
141⁵	4th cycle / 3rd cycle ω H_2O_2	4th cycle ω H_2O_2	4th cycle ω H_2O_2

[Fe(I)]$^{3+}$ MO

	set ①	set ②	5th cycle set ③
9:48 am A_0 (60) →	0.465	0.424	0.419
10:48 am (135) →	0.421	0.437	0.406
12:05 pm (210) →	0.412	0.430	0.399
1:20 pm (280) →	0.405	0.418	0.399
2:30 pm (340) →	0.401	0.413	0.396
3:30 pm (400) →	0.386	0.401	0.389
4:30 pm (455) →	0.385	0.399	0.389
5:55 pm →	0.374	0.378	0.295
09/20/23 9:30 am (1415) →	0.273 5th cycle 4th @ H_2O_2	0.248 5th cycle	0.292 5th cycle

Michaelis-Menten Rate Constant calculation for Mn(Allyl Me Bcyclam)Cl_2 Polymer (LG-117) for degradation of MO ⇒

time → Abs (we have it)

calculate ΔA, $(A_t - A_0)$ at given t.

ΔA is product conc.

calculate Rate of formation of Product

$V(\text{rate}) = \frac{\Delta A}{t}$, unit → min^{-1}

Beer's law, $A = \epsilon cl$

calculate ϵ, from $A_0 = 0.3725$, $C = 1.53$ mM, $l = 1$ cm

$\epsilon = \frac{A_0}{cl} = 0.24346\ mM^{-1} cm^{-1}$

Now, calculate substrate conc. [S]

using A_t, ϵ is known. $A_t = \epsilon [S] \Rightarrow [S] = \frac{A_t}{\epsilon}$