

Research on disposal of wastewater in Industry by EM and coagulation agent

Xue gang¹ Guo shuxian¹ Wang dongmei¹ Zang ji Yamada Tanenaru²

¹ The Biological and Chemical Department of Nanyang Institute of Science & Technology, 80# Changjiang Road, Nanyang City, Henan Province, 473004 PR China

² Japanese Agricultural expert Visiting Professor at Nanyang Institute of Technology
e-mail: Gang xue1@ yahoo.com Fax: + 86-377-3128175

Abstract

This essay deals with the disposal of wastewater from alcohol and biological pharmaceutical factories, with EM technology and coagulation agent. The results of single factor and orthogonal experiments show that different concentration of EM, temperature, PH value, time can obviously influence the effects of treatment (see Table1). By LSR test (See Table 2) If the amount of EM is 3‰—5‰, it makes no difference. To save costs, 3‰ is appropriate. When the temperature is 0°C or 40 °C, COD is not lowered. 10 °C, 20 °C, 30 °C makes no difference .So the treatment can be performed at natural temperature. Treatment time from 24—60 hours. makes no difference, The best length of time is 36 hours . The best composition of *orthogonal experiment* is B₃A₃C₁.(see Table 3) Namely the amount of EM is 5‰, temperature is 30°C, PH value is 5. Major COD, BOD and SS will be greatly decreased, but still can't meet the standards and the disposed water still contains a lot of pigment. Through experiments of coagulation agent show the best composition is A₂B₃C₃. Namely PH value is 8, EM is 1.24ml, time is 2 hrs. and COD index meets the standards (<350mg/L).(see Table 4)
Key words: *effective microorganism, coagulation agent, high concentration industrial wastewater, orthogonal experiment*

Table 1 .COD content of different amount of EM, PH value, temperature, time in treating wastewater:

Repeat	Alcohol wastewater																			
	Amount of EM(‰)					temperature(°c)					PH				time(h)					
	1	2	3	4	5	0	10	20	30	40	3	4	5	6	7	12	24	36	48	60
1	730	667	618	578	581	2600	662	600	661	1981	1690	662	505	505	890	1601	662	563	701	713
2	760	675	635	595	593	3001	620	596	681	1009	1060	600	603	605	819	1059	689	608	699	691
3	750	695	625	615	614	2896	505	503	593	1790	990	703	652	701	913	1503	666	591	681	689
Σ X	2240	2037	1878	1788	1788	8497	1787	1699	1935	4781	3740	1965	1760	1881	2622	4163	2017	1762	2081	2093
\bar{X}	746	679	626	596	596	2832	596	566	645	1594	1247	655	587	604	874	1388	672	587	694	698
F	54.7**					245**					6.04**				19.02**					

Table2. the table of LSR test

Amount of EM	\bar{X}	5%	1%	temperature	\bar{X}	5%	1%	PH	\bar{X}	5%	1%	Time	\bar{X}	5%	1%
1‰	746.7	a	A	0°C	2832	a	A	3	1247	a	A	12h	1388	a	A
2‰	679	ab	AB	40°C	1594	b	B	7	874	b	B	60h	698	b	B
3‰	626	b	AB	30°C	645	c	C	4	655	c	C	48h	694	b	B
4‰	596	b	B	10°C	596	c	C	6	604	c	C	24h	672	b	B

All references herein to EM™ or Effective Microorganisms™ mean the specific technology discovered by Dr. Teruo Higa that is exclusively manufactured, marketed and distributed by EM Research Organization, Inc. and its licensees under the brand name EM•1®.

5‰	596	b	B	20°C	566	c	C	5	587	c	C	36h	587	b	B
----	-----	---	---	------	-----	---	---	---	-----	---	---	-----	-----	---	---

Table 3. Analysis of orthogonal experiment .(Below is the list of COD. BOD and SS omitted)

Number	Alcohol wastewater					wastewater of medicine					
	A	B	C	D	COD ml/L	A	B	C	D	COD ml/L	
1	1(1‰)	1(10°C)	1(5)	1	784	1(1°C)	1(10°C)	1(5)	1	980	
2	1	2(20°C)	2(6)	2	708	1	2(20°C)	2(6)	2	885	
3	1	3(30°C)	3(7)	3	689	1	3(30°C)	3(7)	3	862	
4	2(3‰)	1	2	3	786	2(3‰)	1	2	3	982	
5	2	2	3	1	663	2	2	3	1	829	
6	2	3	1	2	633	2	3	1	2	792	
7	3(5‰)	1	3	2	730	3(5‰)	1	3	2	912	
8	3	2	1	3	585	3	2	1	3	730	
9	3	3	2	1	608	3	3	2	1	760	
K ₁	2181	2300	2002			2727	2874	2502			
K ₂	2082	1956	2102			2603	2444	2627			
K ₃	1923	1930	2082			2402	2414	2603			
\bar{K}_1	727	767	667			909	958	834			
\bar{K}_2	694	652	701			868	814	876			
\bar{K}_3	641	643	694			801	804	868			
R	86	117	33			108	154	42			
F	350**	902**	66*			249**	613**	41*			
Best composition	B ₃ A ₃ C ₁					B ₃ A ₃ C ₁					

Table 4. Analysis of orthogonal experiment by high molecular coagulation agent

Number	Alcohol wastewater					wastewater of medicine					
	A	B	C	D	COD ml/L	A	B	C	D	COD ml/L	
1	1(7)	1(0.75)	1(1.5h)	1	463	1(7)	1(0.75)	1(1.5h)	1	835	
2	1	2(1.0)	2(2.0h)	2	440	1	2(1.0)	2(2.0h)	2	734	
3	1	3(1.25)	3(2.5h)	3	403	1	3(1.25)	3(2.5h)	3	627	
4	2(8)	1	2	3	273	2(8)	1	2	3	302	
5	2	2	3	1	210	2	2	3	1	278	
6	2	3	1	2	231	2	3	1	2	284	
7	3(9)	1	3	2	287	3(5)	1	3	2	315	
8	3	2	1	3	302	3	2	1	3	309	
9	3	3	2	1	248	3	3	2	1	310	
K ₁	1306	1023	996	921		2196	1452	1428	1423		
K ₂	714	952	961	958		864	1321	1346	1333		
K ₃	837	882	900	978		934	1220	1215	1238		
\bar{K}_1	435	341	332	307		732	484	476	474		
\bar{K}_2	238	317	320	319		288	440	449	444		
\bar{K}_3	279	294	300	326		311	307	405	413		
R	197	47	32	19		421	77	71	62		
F	117**	5.93	2.8			35.4*	<1	<1			
Best composition	A ₂ B ₃ C ₃					A ₂ B ₃ C ₃					

References:

Zhang xihen (1997) Waste water Treatment Engineering

Shen lixian (2000) Microorganic Coagulation agent in wastewater Treatment. Industrial waste water Treatment Journal May, PP1-5.

Wang Ling (1998) High concentration organic waste water Treatment by biology. Industrial water Drain All references herein to EM™ or Effective Microorganisms™ mean the specific technology discovered by Dr. Teruo Higa that is exclusively manufactured, marketed and distributed by EM Research Organization, Inc. and its licensees under the brand name EM•1®.

Journal Jan, PP43-49.

Zhang Xin (1997) Environmental Inspection experiments .

Xue Gang , Zhao xin (1999) Instrument Analysis Experiment.



All references herein to EM™ or Effective Microorganisms™ mean the specific technology discovered by Dr. Teruo Higa that is exclusively manufactured, marketed and distributed by EM Research Organization, Inc. and its licensees under the brand name EM•1®.