Supplementary Materials

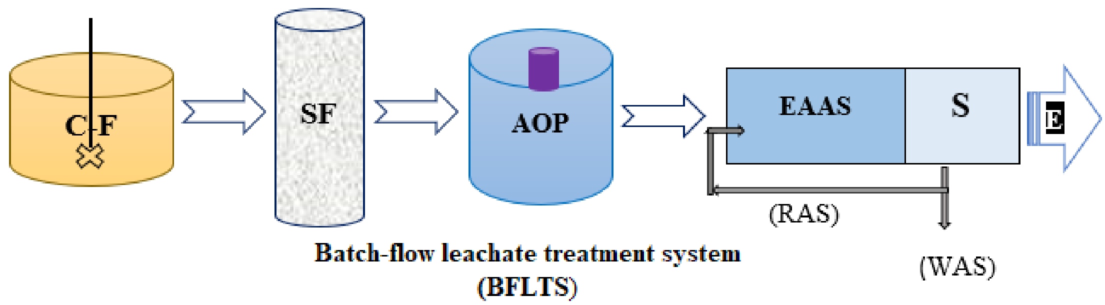

Fig. S1. Different stages of leachate treatment

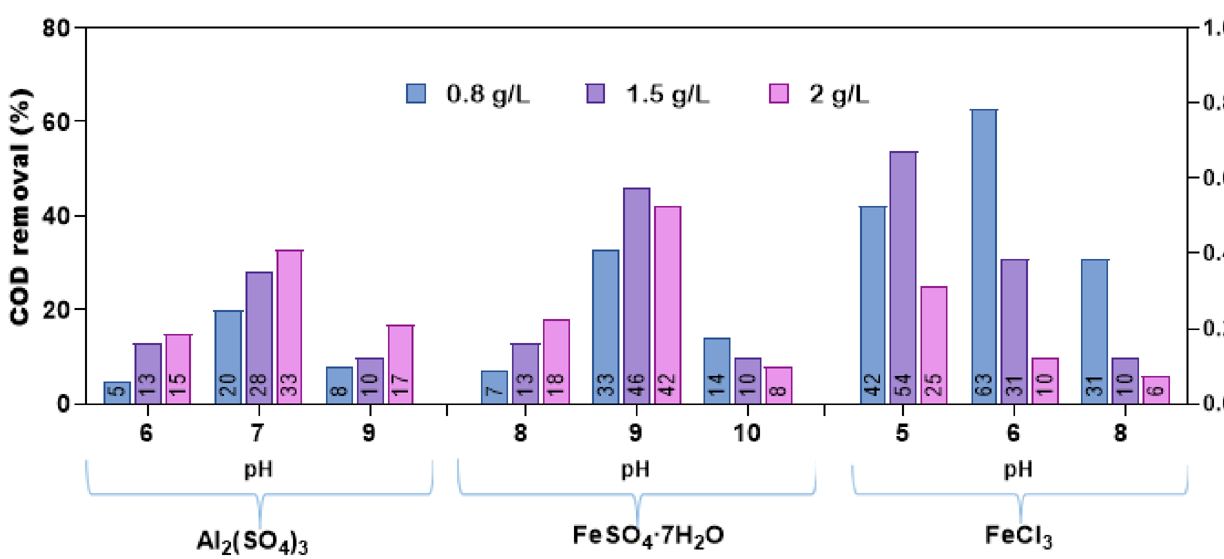

Fig. S2. Effect of pH and coagulant (Aluminum sulphate, Iron sulphate, Iron chloride) dosage in COD removal from synthetic leachate by coagulation/flocculation.

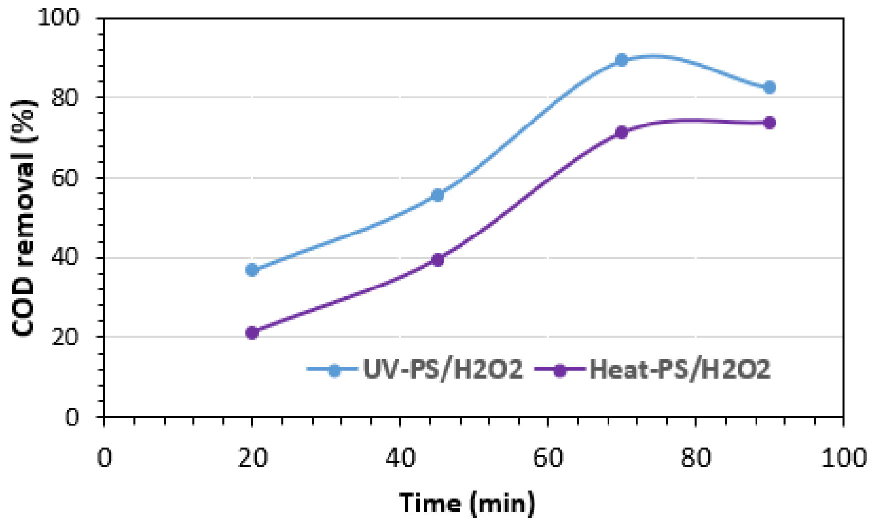

Fig. S3. The effect of time, and UV- PS/H2O2 process (Activated by UV (15 W), PS 2.5 g L^{-1}, H_2O_2 1.5 g L^{-1}), and Heat- PS/H_2O_2 (Activated by Heat (65°C), PS 3 g L^{-1}, H_2O_2 2 g L^{-1}) on leachate COD removal efficiency (SL2).

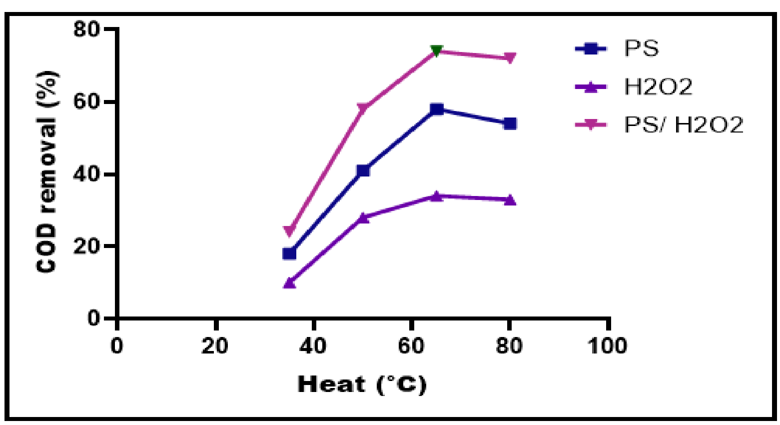

Fig. S4. Removal efficiency (%) of COD by three peroxides under various temperatures. (35°C, 50°C, 65°C, 80°C). The initiation concentration of COD is 5246±110 mg L^{-1}; the Optimized conditions (3 g L^{-1} PS, 2 g L^{-1} H_2O_2, pH 7, time 90 min).

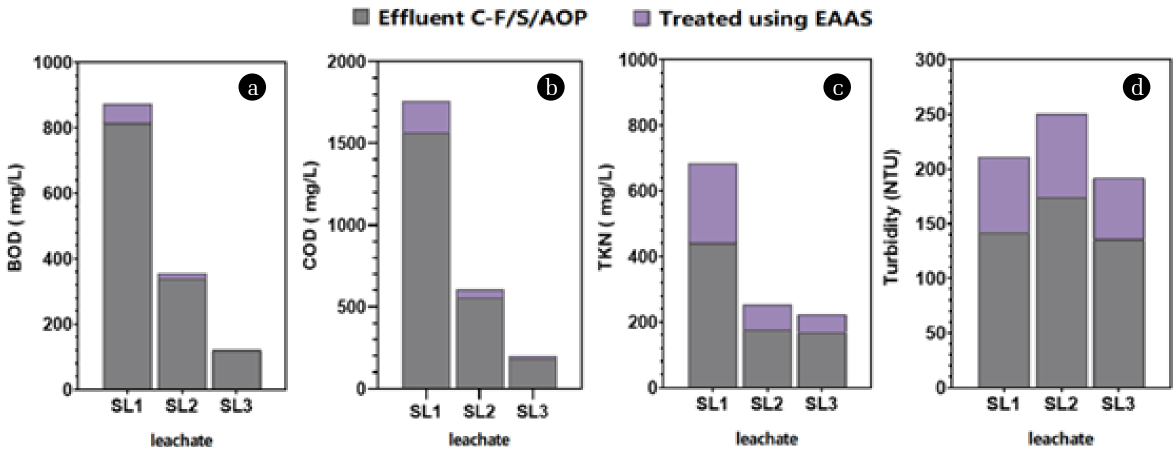

Fig. S5. Comparison of removal of experimental variables from C-F/SF/AOP effluent, for different types of leachates using extended aeration-activated sludge treatment (EAAS). (HRT= 2 days, SRT= 23 days and 4 h aeration).

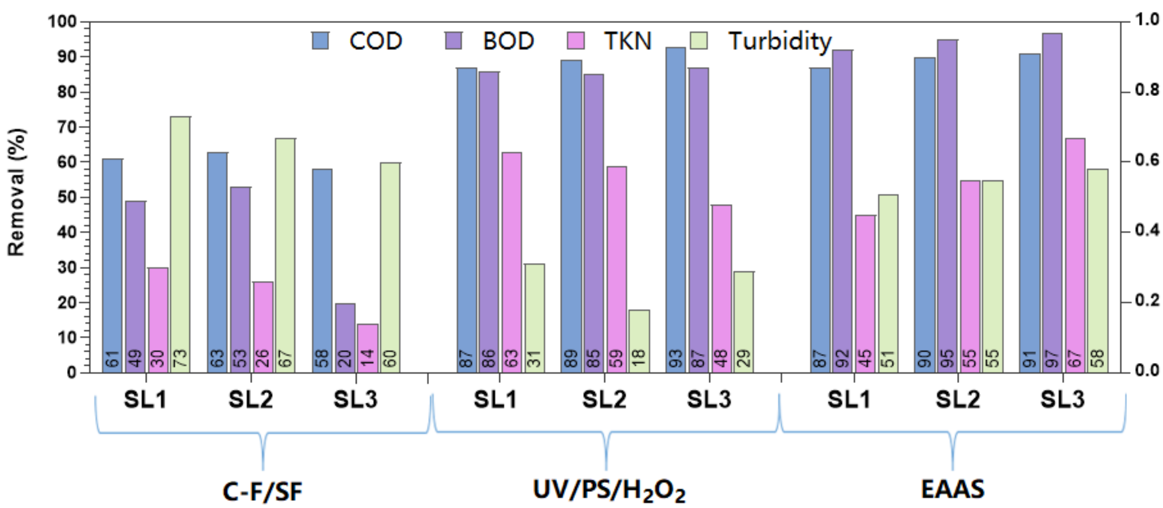

Fig. S6. Comparison of the removal efficiency of three different treatment processes used by the batch flow leachate treatment system (BFLTS) for four experimental variables in the treatment of various types of leachates.

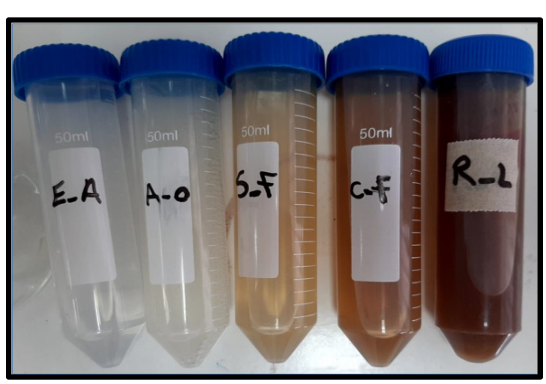

Fig. S7. Effluent obtained from various treatment processes by batch flow leachate treatment system (BFLTS).

Table S1. Synthetic leachate's chemical composition

Component	Quantity per litre
Acetic acid	7 mL
Butyric acid	1 mL
K_2HPO_4	30 mg
NaCl	1440 mg
$KHCO_3$	312 mg
$NaNO_3$	50 mg
$MgSO_4$	156 mg
Glucose	523 mg
Urea	115 mg
$NaHCO_3$	3012 mg
KOH	1920 mg
NH_4Cl	520 mg
NH_4HCO_3	2439 mg
NaOH	Titrate to a pH of 6.4–8.5
Fulvic acid	15 mg
Humic acid	15 mg
Trace metal solution (TMS)	1 mL
Distilled Water	To make 1 L
Composition of rare metal solution (TMS)	
$FeSO_4$	4000 mg
H_3BO_4	50 mg
As_2O	700 mg
CdO	100 mg
K_2CrO_4	500mg
$HgSO_4$	100 mg
Pb $(NO_3)_2$	200 mg
$Cl_2Sn.2H_2O$	50 mg
$ZnSO_4.7H_2O$	500 mg
$CuSO_4.5H_2O$	150 mg
$MnSO_4.7H_2O$	1000 mg
$CoSO_4.7H_2O$	150 mg
$NiSO_4.6H_2O$	500 mg
H_2SO_4 (96%)	1 mL
Distilled Water	To make 1 L

Table S2. General characteristics of the municipal solid waste leachate

Parameter	Winter			Summer		
	Young	Middle-aged	Elderly	Young	Middle-aged	Elderly
COD (mg/L)	30591±650	24680±315	14800±270	32810±740	28375±410	18541±550
BOD_5(mg/L)	11356±420	7289±380	2495±110	14200±1100	8950±350	3635±280
BOD_5/COD ratio	0.37	0.29	0.16	0.43	0.31	0.19
pH	6.2±0.2	7.5±0.03	8.2±0.62	5.9±0.21	7.2±0.36	8±0.03
E.C. (μS/cm) (20 ℃)	5720±80	5180±47	3261±35	9204±75	8697±45	5712±50
TSS (mg/L)	6211±90	4143±76	3725±58	5860±65	3392±50	1930±42
Turbidity (NTU)	749±81	738±38	692±20	620±73	580±33	440±20
TKN (mg/L)	1836±63	1048±50	480±28	1615±50	950±25	427±16
Colour	Dark brown	Black	Dark black	Dark brown	Black	Dark black

Table S3. Efficacy of Batch-flow leachate treatment system (BFLTS) on COD, BOD, TKN, and Turbidity removal of actual leachate

Type RL	Parameter	Raw leachate	C-F/SF	UV- PS/H_2O_2	EAAS
Young	COD (mg/L) (% removal)	32810±740	13124±530 (60)	1863±55 (85.8)	251±20 (86.5)
	BOD (mg/L) (% removal)	14200±1100	7455±250 (47.5)	1140±20 (84.7)	104±10 (90.8)
	BOD_5/COD ratio	0.43	0.56	0.62	0.41
	TKN (mg/L) (% removal)	1615±50	1183±15 (26.7)	479±15 (59.4)	281±10 (41.2)
	Turbidity (NTU) (% removal)	620±73	180±4 (71)	128±5 (28.5)	65±2 (48.7)
Middle-aged	COD (mg/L) (% removal)	28375±410	12059±150 (57.5)	1688±50 (86)	199±20 (88.2)
	BOD (mg/L) (% removal)	8950±350	5047±280 (43.6)	943±22 (81.3)	66±8 (93)
	BOD_5/COD ratio	0.31	0.41	0.56	0.33
	TKN (mg/L) (% removal)	950±25	746±20 (21.4)	341±4 (54.2)	175±12 (48.7)
	Turbidity (NTU) (% removal)	580±33	204±5 (64.8)	161±5 (21)	78±9 (51.6)
Elderly	COD (mg/L) (% removal)	18541±550	8565±300 (53.8)	899±25 (89.5)	135±10 (85)
	BOD (mg/L) (% removal)	3635±280	2948±70 (18.9)	451±15 (84.7)	52±5 (88.4)
	BOD_5/COD ratio	0.19	0.34	0.5	0.38
	TKN (mg/L) (% removal)	427±16	367±10 (14)	207±5 (43.5)	80±4 (61.4)
	Turbidity (NTU) (% removal)	440±20	183±4 (58.3)	135 (25.8)	58±2 (56.5)

Table S4. Comparison literature data of leachate treatment under different oxidation processes

Process	Experimental Conditions					Results	Reference
	Persulfate dosage	Catalytic dosage	Reaction time	pH	Temperature	Removal, %	
UV-activated PS/H_2O_2	2.5 g L^{-1} $K_2S_2O_8$	1.5 g L^{-1} H_2O_2 + 15W UV	70	7.1	room (25 ℃)	85, COD	This study
Heat-activated PS/H_2O_2	3 g L^{-1} $K_2S_2O_8$	2 g L^{-1} H_2O_2 + 15W UV	90	6.8	65 ℃	81, COD	This study
PS + AC	0.81 g/L^{-1} $S_2O_8^{-2}$	0.75 g/L AC	4 h	6.7	150 ℃	77.8, COD	[1]
UVSolar/O_3/H_2O_2/$S_2O_8^{-2}$	0.2 g L^{-1} $S_2O_8^{-2}$	0.67 g L^{-1} H_2O_2	250 min	8	40 ℃	96, COD	[2]
H_2O_2 - PS	PS/COD:12	H_2O_2/COD=2	85min	10.8	room (28 ℃)	56.9, COD	[3]
Heat - PS	PS/COD:5.2	-	120 min	10.9	80 ℃	93.5, COD	[3]
PS+H_2O_2	5.88 g S_2O_8 $^{-2}$	8.63 g H_2O_2	120 min	11	room (28 ℃)	81, COD	[4]
UV-PMS	0.048 mol/L^{-1} $KHSO_6$	15W UV	60 min	7.5	room (25 ℃)	37.39, COD	[5]
UV-H_2O_2	-	0.048 mol/L^{-1} H_2O_2 + 15W UV	60 min	7.5	room (25 ℃)	28.59, COD	[5]
UV-PMS/H_2O_2	0.020 mol/L^{-1} PMS	0.028 mol/L^{-1} H_2O_2 + 15W UV	60 min	7.5	room (25 ℃)	30.51, COD	[5]
PDS/heat	PDS/12COD= 2	-	24h	4	50 ℃	91% COD	[6]
PDS/heat	PDS/COD=5.2	-	120 min	10.9	80 ℃	93.5% COD	[7]
PDS/heat/Ag(I)	PDS=112.5 g/L	Ag=0.25 g/L	30 min	-	80 ℃	20% COD	[8]

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