Supplementary Information (SI)

Correlation of sonochemical activities measured via dosimetry and an area-selective analysis of sono(chemi)luminescence

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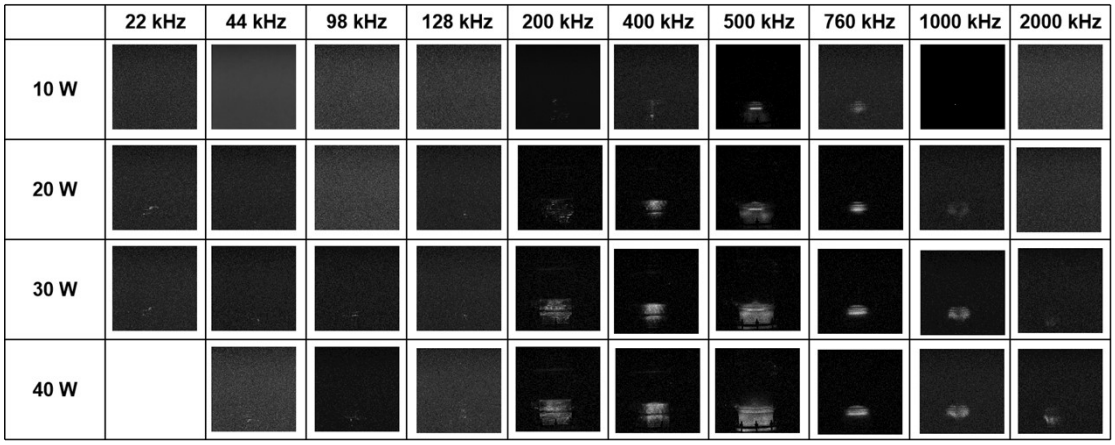
Appendix A.
image-processing program for selective method

```
clear,clc,close all
%% read image
name='SCL-22kHz-10w-1';Format='.tif';
image_name=[name Format];
image_i0=imread(image_name);
image=dir(image_name);
image_name_denoised=[name '-DeNoiseAI-severe-noise' Format]; % read the denoised image
image_i=imread(image_name_denoised);
image_i=rgb2gray(image_i);
image_i_binary=imbinarize(image_i);
image_i_binary=bwareaopen(image_i_binary,100,4);

%% give the coordinate of the region of interest (ROI) in the image
axis_distance_1=150;
axis_distance_2=750;
bottom_distance_1=600;
bottom_distance_2=1000;

%% determine the cavitation area (CA) and acquire the quantitative information
L1=bwlabel(image_i_binary);
stats=regionprops(image_i_binary,'basic');
center=cat(1,stats.Centroid);
index = find(center(:,1)>axis_distance_1 & center(:,1)<axis_distance_2 &
center(:,2)<bottom_distance_2 & center(:,2)>bottom_distance_1);
desired_area=ismember(L1,index);
se=strel('disk',1);
desired_area_1=bwmorph(desired_area,'close');
stats_1=regionprops(desired_area_1,'Area');
area=sum([stats_1.Area]); % area of the CA
desired_area_1_edge=bwmorph(desired_area_1,'remove');
[r1,c1]=find(desired_area_1==1);
[r2,c2]=find(desired_area_1_edge==1);
edge=[r2,c2];
gray_value=0;
for i=1:length(r1)
    gray_value=gray_value+double(image_i0(r1(i),c1(i))); % the total intensity of the CA
end
gray_value_avg=gray_value/area;% the average intensity of the CA
```

Appendix B. photos about SL and SCL with 200 ml and 400 ml

Photos about SL and SCL

(a) 200 ml - SL



(b) 200 ml - SCL

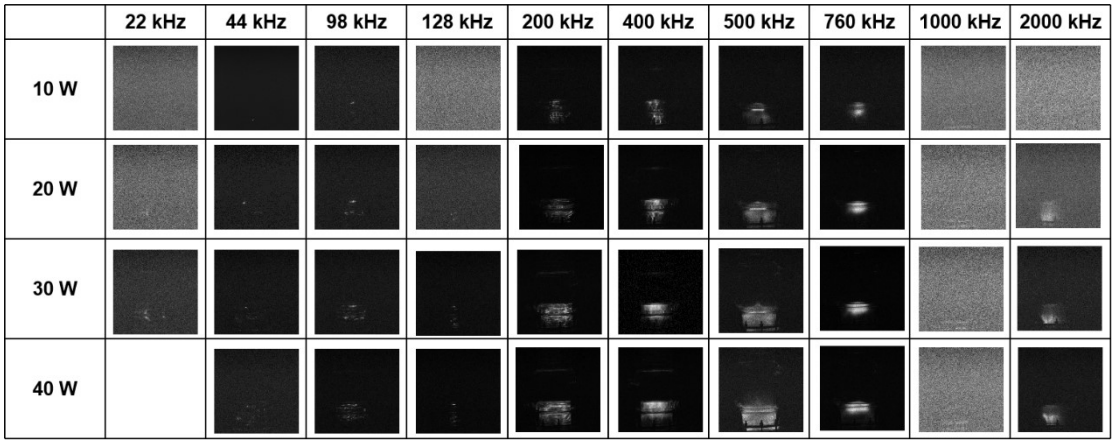
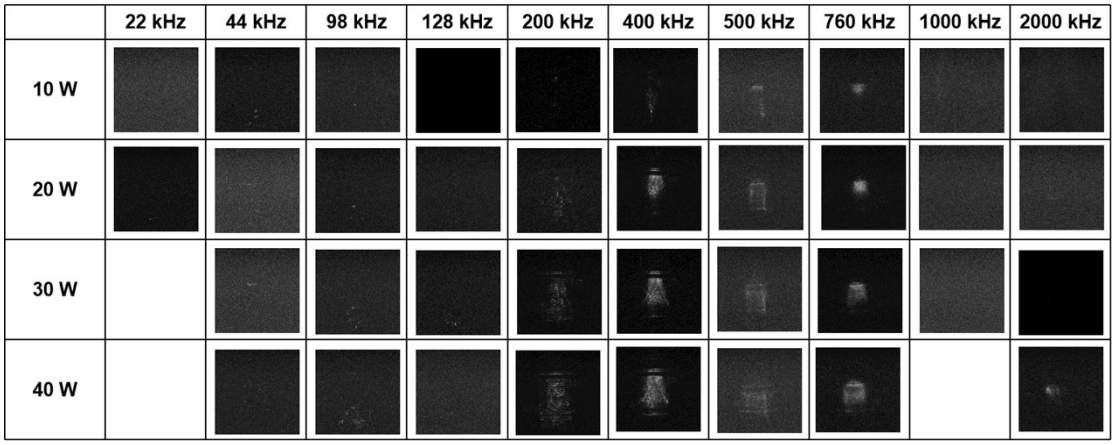


Figure. S1 Sono-/ sonochemi-luminescence intensity distribution for all testing frequencies and powers at 200ml reactor volume: (a) SL and (b) SCL.

(a) 400 ml - SL



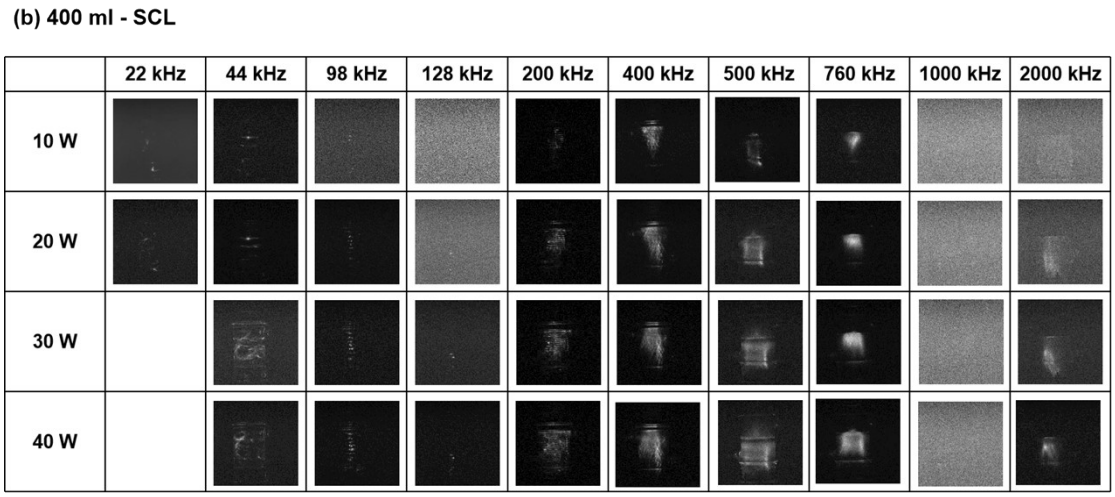


Figure. S2 Sono-/ sonochemi-luminescence intensity distribution for all testing frequencies and powers at 400ml reactor volume: (a) SL and (b) SCL

Appendix C. data

Table S1. The PD_L (W L^{-1}) for all experimental setting

Volume (ml) / Loading-power (W)	200	300	400
10	50	33.33	100
20	100	66.67	75
30	150	100	50
40	200	133.33	25

Table S2. The calorimetric powers (W) for all experimental setting

Loading-power (W)	Reactor (ml)	Calorimetric power (W)									
		22 kHz	44 kHz	98 kHz	128 kHz	200 kHz	400 kHz	500 kHz	760 kHz	1000 kHz	2000 kHz
10	200	7.05 ± 0.82	5.35 ± 1.13	6.09 ± 2.11	6.64 ± 2.18	6.23 ± 0.35	7.17 ± 0.37	9.01 ± 0.68	7.50 ± 0.54	6.96 ± 0.08	6.28 ± 1.40
	300	6.25 ± 2.12	8.97 ± 1.19	7.56 ± 0.72	6.17 ± 1.74	7.43 ± 0.80	9.26 ± 0.27	9.31 ± 0.51	8.45 ± 0.95	7.12 ± 0.38	7.31 ± 0.62
	400	5.69 ± 1.58	6.58 ± 0.95	4.79 ± 0.82	8.09 ± 3.04	8.75 ± 1.12	8.48 ± 0.28	7.33 ± 0.80	8.79 ± 1.01	7.03 ± 0.22	9.34 ± 0.38
20	200	9.15 ± 1.14	8.61 ± 3.00	10.48 ± 2.74	16.12 ± 1.04	16.42 ± 1.36	13.34 ± 3.16	16.56 ± 0.26	13.64 ±0.99	12.99 ± 0.28	13.79 ± 0.47
	300	13.53 ± 1.93	11.58 ± 0.31	11.28 ± 3.46	12.54 ± 1.40	13.99 ± 0.46	12.83 ± 0.25	17.84 ± 1.08	14.19 ± 0.91	16.82 ± 1.12	17.37 ± 3.31
	400	17.23 ± 1.79	10.80 ± 4.45	15.16 ± 3.32	11.00 ± 0.62	14.74 ± 4.08	15.99 ± 0.85	15.81 ± 1.34	14.55 ± 0.93	15.03 ± 0.15	18.37 ± 1.55
30	200	10.84 ± 0.97	13.70 ± 3.14	13.00 ± 4.26	20.12 ± 1.35	17.87 ± 1.31	27.38 ± 0.85	23.14 ± 2.43	20.62 ± 0.93	19.42 ± 0.22	23.28 ± 2.64
	300	14.94 ± 2.62	25.57 ± 0.65	16.30 ± 4.26	14.73 ± 2.97	18.16 ± 2.62	22.09 ± 1.58	20.18 ± 0.20	20.40 ± 2.39	18.84 ± 0.58	20.29 ± 0.71
	400	21.70 ± 3.06	27.55 ± 3.18	18.06 ± 2.64	16.72 ± 4.18	22.89 ± 1.72	21.12 ± 2.55	22.42 ± 3.63	22.16 ± 0.92	23.41 ± 1.78	21.65 ± 1.96
40	200	14.86 ± 1.61	21.06 ± 5.97	24.84 ± 2.54	23.37 ± 2.02	24.22 ± 3.50	29.25 ± 1.47	27.29 ± 1.01	26.58 ± 0.18	-	28.27 ± 0.70
	300	23.39 ± 2.20	30.74 ± 1.20	24.84 ± 2.54	21.12 ± 2.67	27.17 ± 3.62	29.71 ± 0.95	25.05 ± 1.60	22.03 ± 0.65	-	31.09 ± 4.33
	400	30.59 ± 7.03	30.45 ± 2.77	28.71 ± 1.46	23.29 ± 2.15	28.40 ± 4.80	30.10 ± 1.15	28.60 ± 1.22	37.90 ± 1.32	-	25.83 ± 1.99

Table S3. The data of A_{SA} in SL

Volume	Frequency / Power	22 kHz	44 kHz	98 kHz	128 kHz	200 kHz	400 kHz	500 kHz	760 kHz	1000 kHz	2000 kHz
200 ml	10 W	0±0	0±0	0±0	0±0	4492±1241	10702±960	40477±7125	13997±570	0±0	0±0
	20 W	5177±63	1024±369	322±16	1458±4	22997±3966	40095±2641	82894±2477	24670±859	21085±366	0±0
	30 W	3823±899	2055±136	4504±1324	3311±278	85682±4053	54060±3665	96048±3090	17270±2569	41179±816	15409±1047
	40 W	4114±851	4690±654	8952±732	6160±65	102695±1376	72568±7681	127465±14524	37249±2193	41409±4979	29731±1742
300 ml	10 W	0±0	4105±2382	0±0	0±0	8631±13	35281±3615	32028±4643	28105±1924	0±0	0±0
	20 W	0±0	3363±774	3498±397	0±0	17951±6621	58965±3167	92900±1406	41699±2563	0±0	0±0
	30 W	0±0	2954±374	3837±244	1283±809	36035±4685	76071±9194	126536±11740	52592±5074	0±0	30727±1525
	40 W	0±0	1049±110	6829±1411	3142±176	122980±8822	74385±2829	160905±2502	48798±3441	0±0	28516±844
400 ml	10 W	0±0	2689±60	805±88	0±0	7424±661	16687±2171	30086±999	30429±2324	0±0	0±0
	20 W	1593±90	1483±419	4517±400	1318±745	27425±1368	59157±4085	55685±3937	49123±2801	0±0	0±0
	30 W	0±0	2981±577	7093±875	3420±345	46870±2519	80535±3329	87041±5256	82865±10054	0±0	0±0
	40 W	0±0	5180±815	12338±2229	4681±36	59418±528	120838±8479	138395±31035	116868±984	0±0	24757±3814

Table S4. The data of P_{eff} (%) in SL

Volume	Frequency / Power	22 kHz	44 kHz	98 kHz	128 kHz	200 kHz	400 kHz	500 kHz	760 kHz	1000 kHz	2000 kHz
200 ml	10 W	0±0	0±0	0±0	0±0	4.73±1.31	11.27±1.01	42.62±7.50	14.74±0.60	0±0	0±0
	20 W	5.45±0.07	1.08±0.39	0.34±0.02	1.54±0	24.21±4.18	42.22±2.78	87.28±2.61	25.98±0.90	22.20±0.39	0±0
	30 W	4.02±0.95	2.16±0.14	4.74±1.39	3.49±0.29	90.22±4.27	56.92±3.86	101.13±3.25	18.18±2.71	43.36±0.86	16.22±1.1
	40 W	4.33±0.9	3.08±1.94	9.43±0.77	6.49±0.07	108.13±1.45	76.41±8.09	134.21±15.29	39.22±2.31	43.6±5.24	31.3±1.83
300 ml	10 W	0±0	2.88±1.67	0±0	0±0	6.05±0.01	24.75±2.54	22.47±3.26	19.72±1.35	0±0	0±0
	20 W	0±0	2.36±0.54	2.45±0.28	0±0	12.59±4.65	41.37±2.22	65.17±0.99	29.25±1.8	0±0	0±0
	30 W	0±0	2.07±0.26	2.69±0.17	0.9±0.57	25.28±3.29	53.37±6.45	88.77±8.24	36.9±3.56	0±0	21.56±1.07
	40 W	0±0	0.74±0.08	4.79±0.99	2.2±0.12	86.28±6.19	52.18±1.98	112.88±1.76	34.23±2.41	0±0	20.01±0.59
400 ml	10 W	0±0	1.41±0.03	0.42±0.046	0±0	3.91±0.35	8.78±1.14	15.83±0.53	16.01±1.22	0±0	0±0
	20 W	0.84±0.05	0.78±0.22	2.38±0.21	0.69±0.39	14.43±0.72	31.12±2.15	29.29±2.07	25.84±1.47	0±0	0±0
	30 W	0±0	1.57±0.3	3.73±0.46	1.8±0.18	24.65±1.33	42.36±1.75	45.78±2.76	43.59±5.29	0±0	0±0
	40 W	0±0	2.72±0.43	6.49±1.17	2.46±0.02	31.25±0.28	63.56±4.46	72.8±16.32	61.47±0.52	0±0	13.02±2.01

Table S5. The data of A_{SA} in SCL

Volume	Frequency / Power	22 kHz	44 kHz	98 kHz	128 kHz	200 kHz	400 kHz	500 kHz	760 kHz	1000 kHz	2000 kHz
200 ml	10 W	278±74	426±73	2876±181	274±56	23108 ±6883	45441 ±6089	61662±4669	59002±9253	9373±1559	17200±9737
	20 W	7495±1334	4102±777	9326±960	2735±368	39823 ±2945	56370±4238	99181±2761	41622±826	10700±488	64156±3628
	30 W	13652±881	8701±655	16228±654	5726±192	77604 ±4056	61478±1514	122537±11112	43636±384	13407±382	56194±1727
	40 W	0±0	10522±1068	16014±58	11015±71	91316 ±4673	83879 ±3197	188586±9046	60858±6774	20113±2384	59058±885
300 ml	10 W	4585±834	2377±200	3549±219	957±80	16409±1433	53004±13363	76478±4262	62838±3020	10363±3914	4980±1731
	20 W	17468±1076	9652±1163	11155±1703	2021±93	33622±1957	67406±3496	141455±19674	53587±1696	9045±3951	3688±491
	30 W	0±0	24402±828	13607±696	5080±537	67752 ±6890	97054±5291	191112±2650	90466±4316	8886±4388	87009±3714
	40 W	0±0	31871±759	20371±1374	7114±617	101203±4805	126819±4697	206263±17297	143361±6515	11282±2407	54391±3202
400 ml	10 W	5446±37	16787±1968	2269±186	176±28	13435 ±2954	65557±2828	68887±16271	55626±2713	11921±1169	1377±11346
	20 W	12449±2077	27680±932	10305±226	2315±246	47384±6629	96346±8415	145595±12280	74009±2571	14649±3778	180846±8142
	30 W	0±0	65398±2035	16232±1112	2997±401	79854±2996	110434±21356	183491±2808	115046±10901	19859±640	95195±5927
	40 W	0±0	59540±3758	20005±372	5641±550	115569±5382	123147±2693	256041±18145	136210±7430	29874±3259	69641±4246

Table S6. The data of P_{eff} (%) in SCL

Volume	Frequency / Power	22 kHz	44 kHz	98 kHz	128 kHz	200 kHz	400 kHz	500 kHz	760 kHz	1000 kHz	2000 kHz
200 ml	10 W	0.29±0.08	0.45±0.08	3.03±0.19	0.29±0.06	24.33±7.25	47.85±6.41	64.93±4.92	62.13±9.74	9.87±1.64	18.11±10.25
	20 W	7.89±1.4	4.32±0.82	9.82±1.01	2.88±0.39	41.93±3.1	59.35±4.46	104.43±2.91	43.83±0.87	11.27±0.51	67.55±3.82
	30 W	14.38±0.93	9.16±0.69	17.09±0.69	6.03±0.2	81.71±4.27	64.73±1.59	129.02±11.7	45.95±0.4	14.12±0.4	59.17±1.82
	40 W	0±0	11.08±1.12	16.86±0.06	11.6±0.07	96.15±4.92	88.32±3.37	198.57±9.52	64.08±7.13	21.18±2.51	62.18±0.93
300 ml	10 W	3.22±0.59	1.67±0.14	2.49±0.15	0.67±0606	11.51±1.01	37.18±9.37	53.65±2.99	44.08±2.12	7.27±2.75	3.49±1.21
	20 W	12.25±0.75	6.77±0.82	7.83±1.19	1.42±0.07	23.59±1.37	47.29±2.45	99.24±13.8	37.59±1.19	6.35±2.77	2.59±0.34
	30 W	0±0	17.12±0.58	9.55±0.49	3.56±0.38	47.53±4.83	68.09±3.71	134.07±1.86	63.47±3.03	6.23±3.08	61.04±2.61
	40 W	0±0	22.36±0.53	14.29±0.96	4.99±0.43	71±3.37	88.97±3.3	144.7±12.13	100.57±4.57	7.91±1.69	38.16±2.25
400 ml	10 W	2.86±0.02	8.83±1.04	1.19±0.1	0.09±0.01	7.07±1.55	34.48±1.49	36.23±8.56	29.26±.143	6.27±0.61	0.72±5.97
	20 W	6.55±1.09	14.56±0.49	5.42±0.12	1.22±0.13	24.92±3.49	50.68±4.43	76.58±6.46	38.93±1.35	7.71±1.99	95.13±4.28
	30 W	0±0	34.4±1.07	8.54±0.58	1.58±0.21	42.00±1.58	58.09±11.23	96.52±6.74	60.51±5.73	10.45±0.34	50.07±3.12
	40 W	0±0	31.32±1.98	10.52±0.2	2.97±0.29	60.79±2.83	64.78±1.42	134.68±9.54	71.65±3.91	15.71±1.71	36.63±2.23