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APPENDIX

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

APPENDIX A

CALCULATION OF AMOUNT OF WATER ADDED TO SUPERCRITICAL WATER TREATMENT

Density – temperature – pressure table of water at supercritical water condition were tabulated in appendix B. Amount of water added to supercritical water reactor was calculated from density of water at supercritical water condition by;

$$M = \frac{\rho_{T,P} \times V_{reactor}}{1000}$$

M = amount of water added to reactor (ml)

$\rho_{T,P}$ = Density of water at temperature “T °C “and pressure” P bar”
from appendix B (kg/m³)

$V_{reactor}$ = volume of stainless steel tube reactor (ml)

At temperature “T (°C)”, calculated amount of water placed inside the evacuated stainless steel tube reactor will vaporize and pressurize the pressure inside to “P bar”. For example: experiment condition is 400°C and 250 bar. From appendix B, density of water at this condition is 168.56 kg/m³, so amount of water needed to add to the reactor is 3.708 ml, the volume of the reactor is 22 ml.

APPENDIX B

Isothermal properties of pure water at T = 400.00 °C

(NIST for pure water properties calculation programme: www.nist.gov)

Temp. °C	Pressure (bar)	Density (kg/m ³)	Volume (m ³ /kg)	Internal Energy (kJ/mol)	Enthalpy (kJ/mol)	Entropy (J/mol*K)	Cv (J/mol*K)	Cp (J/mol*K)	Viscosity (uPa*s)	Therm. Cond. (W/m*K)	Phase
400.00	200.00	100.50	0.0099503	-47.161	50.746	100.03	48.709	114.71	26.034	0.10547	vapor
400.00	203.00	103.29	0.0096815	-47.002	50.542	99.649	49.191	118.39	26.138	0.10769	vapor
400.00	204.50	104.72	0.0095492	-46.921	50.439	99.456	49.435	120.31	26.193	0.10885	vapor
400.00	206.00	106.18	0.0094183	-46.838	50.334	99.262	49.681	122.30	26.249	0.11003	vapor
400.00	207.50	107.66	0.0092888	-46.755	50.227	99.066	49.929	124.35	26.307	0.11125	vapor
400.00	209.00	109.16	0.0091605	-46.670	50.120	98.869	50.178	126.47	26.367	0.11251	vapor
400.00	210.50	110.70	0.0090335	-46.585	50.011	98.671	50.430	128.66	26.429	0.11380	vapor
400.00	212.00	112.26	0.0089077	-46.498	49.900	98.471	50.683	130.93	26.492	0.11513	vapor
400.00	213.50	113.85	0.0087831	-46.410	49.788	98.269	50.939	133.28	26.558	0.11650	vapor
400.00	215.00	115.48	0.0086596	-46.321	49.675	98.066	51.196	135.72	26.626	0.11790	vapor
400.00	216.50	117.13	0.0085372	-46.230	49.560	97.861	51.455	138.24	26.696	0.11935	vapor
400.00	218.00	118.82	0.0084158	-46.138	49.444	97.654	51.716	140.86	26.768	0.12085	vapor
400.00	219.50	120.55	0.0082955	-46.045	49.326	97.445	51.980	143.57	26.843	0.12239	vapor
400.00	221.00	122.31	0.0081761	-45.951	49.206	97.234	52.245	146.39	26.920	0.12398	vapor
400.00	221.00	122.31	0.0081761	-45.951	49.206	97.234	52.245	146.39	26.920	0.12398	supercritical
400.00	221.00	122.31	0.0081761	-45.951	49.206	97.234	52.245	146.39	26.920	0.12398	supercritical
400.00	222.50	124.11	0.0080576	-45.854	49.084	97.021	52.512	149.33	27.000	0.12562	supercritical
400.00	224.00	125.94	0.0079400	-45.757	48.961	96.805	52.781	152.38	27.083	0.12731	supercritical
400.00	225.50	127.82	0.0078233	-45.658	48.836	96.588	53.052	155.55	27.169	0.12906	supercritical
400.00	227.00	129.74	0.0077074	-45.557	48.709	96.368	53.326	158.86	27.258	0.13086	supercritical
400.00	228.50	131.71	0.0075923	-45.454	48.580	96.145	53.601	162.31	27.351	0.13272	supercritical
400.00	230.00	133.73	0.0074780	-45.350	48.448	95.920	53.878	165.92	27.446	0.13465	supercritical
400.00	231.50	135.79	0.0073643	-45.244	48.315	95.692	54.157	169.68	27.546	0.13665	supercritical
400.00	233.00	137.91	0.0072513	-45.136	48.180	95.462	54.438	173.61	27.649	0.13871	supercritical
400.00	234.50	140.08	0.0071389	-45.026	48.042	95.228	54.722	177.73	27.756	0.14085	supercritical
400.00	236.00	142.31	0.0070271	-44.914	47.901	94.991	55.007	182.04	27.868	0.14306	supercritical
400.00	237.50	144.59	0.0069159	-44.800	47.759	94.751	55.294	186.56	27.984	0.14535	supercritical

400.00	239.00	146.95	0.0068052	44.683	47.613	94.507	55.583	191.31	28.105	0.14773	supercritical
400.00	240.50	149.37	0.0066949	44.564	47.465	94.260	55.874	196.30	28.231	0.15020	supercritical
400.00	242.00	151.86	0.0065850	44.443	47.314	94.009	56.166	201.54	28.362	0.15276	supercritical
400.00	243.50	154.43	0.0064756	44.319	47.160	93.754	56.460	207.07	28.500	0.15542	supercritical
400.00	245.00	157.07	0.0063665	44.193	47.003	93.495	56.756	212.89	28.643	0.15819	supercritical
400.00	246.50	159.80	0.0062577	44.064	46.843	93.232	57.053	219.04	28.794	0.16107	supercritical
400.00	248.00	162.63	0.0061491	43.932	46.679	92.963	57.352	225.53	28.951	0.16406	supercritical
400.00	249.50	165.54	0.0060408	43.796	46.511	92.690	57.652	232.40	29.116	0.16717	supercritical
400.00	251.00	168.56	0.0059326	43.658	46.340	92.412	57.952	239.67	29.289	0.17042	supercritical
400.00	252.50	171.69	0.0058246	43.516	46.165	92.129	58.253	247.37	29.471	0.17380	supercritical
400.00	254.00	174.93	0.0057167	43.371	45.986	91.839	58.555	255.55	29.662	0.17733	supercritical
400.00	255.50	178.29	0.0056088	43.221	45.803	91.544	58.856	264.22	29.863	0.18101	supercritical
400.00	257.00	181.79	0.0055010	43.068	45.615	91.243	59.157	273.43	30.076	0.18484	supercritical
400.00	258.50	185.42	0.0053931	42.911	45.423	90.935	59.456	283.21	30.300	0.18885	supercritical
400.00	260.00	189.21	0.0052852	42.750	45.225	90.620	59.753	293.61	30.537	0.19303	supercritical
400.00	261.50	193.16	0.0051772	42.584	45.023	90.298	60.048	304.65	30.787	0.19740	supercritical
400.00	263.00	197.27	0.0050691	42.413	44.815	89.969	60.338	316.37	31.053	0.20196	supercritical
400.00	264.50	201.58	0.0049609	42.237	44.601	89.631	60.623	328.80	31.335	0.20671	supercritical
400.00	266.00	206.07	0.0048526	42.056	44.382	89.286	60.902	341.95	31.634	0.21167	supercritical
400.00	267.50	210.78	0.0047443	41.870	44.157	88.932	61.172	355.81	31.952	0.21683	supercritical
400.00	269.00	215.71	0.0046359	41.679	43.925	88.570	61.432	370.38	32.290	0.22220	supercritical
400.00	270.50	220.87	0.0045276	41.482	43.688	88.199	61.679	385.58	32.650	0.22776	supercritical
400.00	272.00	226.27	0.0044195	41.279	43.445	87.820	61.912	401.32	33.033	0.23352	supercritical
400.00	273.50	231.93	0.0043116	41.071	43.196	87.432	62.127	417.45	33.440	0.23944	supercritical
400.00	275.00	237.85	0.0042044	40.858	42.941	87.036	62.324	433.74	33.874	0.24552	supercritical
400.00	276.50	244.03	0.0040979	40.640	42.681	86.634	62.500	449.89	34.334	0.25170	supercritical
400.00	278.00	250.47	0.0039925	40.417	42.417	86.225	62.655	465.55	34.822	0.25796	supercritical
400.00	279.50	257.16	0.0038886	40.191	42.149	85.811	62.788	480.32	35.336	0.26424	supercritical
400.00	281.00	264.09	0.0037866	39.962	41.879	85.394	62.899	493.87	35.878	0.27050	supercritical
400.00	282.50	271.22	0.0036870	39.731	41.607	84.976	62.990	505.92	36.445	0.27671	supercritical
400.00	284.00	278.54	0.0035901	39.499	41.336	84.559	63.061	516.35	37.036	0.28285	supercritical
400.00	285.50	286.02	0.0034963	39.268	41.066	84.143	63.108	525.14	37.649	0.28892	supercritical
400.00	287.00	293.62	0.0034057	39.038	40.798	83.732	63.129	532.23	38.282	0.29490	supercritical
400.00	288.50	301.32	0.0033187	38.809	40.534	83.326	63.117	537.31	38.933	0.30076	supercritical
400.00	290.00	309.07	0.0032355	38.584	40.275	82.927	63.062	539.75	39.596	0.30640	supercritical

-400.00	291.50	316.81	0.0031565	38.364	40.022	82.539	62.959	538.61	-40.269	0.31169	supercritical
-400.00	293.00	324.48	0.0030819	38.150	39.777	82.162	62.803	533.09	-40.944	0.31648	supercritical
-400.00	294.50	332.00	0.0030121	37.944	39.542	81.801	62.597	523.04	-41.613	0.32066	supercritical
-400.00	296.00	339.30	0.0029473	37.747	39.319	81.457	62.349	509.45	-42.271	0.32428	supercritical
-400.00	297.50	346.33	0.0028874	37.560	39.108	81.132	62.070	493.69	-42.912	0.32745	supercritical
-400.00	299.00	353.08	0.0028322	37.384	38.909	80.826	61.774	477.08	-43.534	0.33028	supercritical
-400.00	300.50	359.55	0.0027813	37.217	38.723	80.537	61.469	460.57	-44.135	0.33289	supercritical
-400.00	302.00	365.73	0.0027343	37.059	38.547	80.266	61.164	444.68	-44.715	0.33536	supercritical
-400.00	303.50	371.65	0.0026907	36.911	38.382	80.009	60.863	429.62	-45.274	0.33773	supercritical
-400.00	305.00	377.31	0.0026503	36.770	38.226	79.767	60.570	415.41	-45.814	0.34001	supercritical
-400.00	306.50	382.73	0.0026128	36.636	38.079	79.538	60.285	401.98	-46.335	0.34222	supercritical
-400.00	308.00	387.93	0.0025778	36.509	37.940	79.321	60.009	389.24	-46.837	0.34435	supercritical
-400.00	309.50	392.91	0.0025451	36.389	37.808	79.115	59.742	377.11	-47.322	0.34640	supercritical
-400.00	311.00	397.68	0.0025146	36.275	37.683	78.920	59.484	365.54	-47.790	0.34837	supercritical
-400.00	312.50	402.25	0.0024860	36.166	37.565	78.734	59.234	354.49	-48.241	0.35027	supercritical
-400.00	314.00	406.64	0.0024592	36.062	37.453	78.557	58.993	343.95	-48.676	0.35210	supercritical
-400.00	315.50	410.84	0.0024340	35.963	37.346	78.389	58.759	333.91	-49.095	0.35387	supercritical
-400.00	317.00	414.87	0.0024104	35.868	37.245	78.229	58.534	324.37	-49.500	0.35557	supercritical
-400.00	318.50	418.74	0.0023881	35.778	37.149	78.076	58.317	315.33	-49.889	0.35722	supercritical
-400.00	320.00	422.45	0.0023671	35.692	37.057	77.930	58.108	306.78	-50.265	0.35882	supercritical
-400.00	321.50	426.01	0.0023473	35.610	36.969	77.791	57.906	298.70	-50.628	0.36037	supercritical
-400.00	323.00	429.44	0.0023286	35.531	36.886	77.657	57.712	291.09	-50.979	0.36189	supercritical
-400.00	324.50	432.74	0.0023109	35.455	36.806	77.529	57.525	283.93	-51.318	0.36337	supercritical
-400.00	326.00	435.91	0.0022940	35.382	36.729	77.406	57.346	277.19	-51.645	0.36482	supercritical
-400.00	327.50	438.97	0.0022780	35.312	36.656	77.288	57.174	270.85	-51.962	0.36623	supercritical
-400.00	329.00	441.92	0.0022628	35.245	36.586	77.175	57.009	264.89	-52.269	0.36762	supercritical
-400.00	330.50	444.78	0.0022483	35.180	36.518	77.066	56.850	259.29	-52.567	0.36898	supercritical
-400.00	332.00	447.53	0.0022345	35.117	36.454	76.960	56.698	254.01	-52.856	0.37032	supercritical
-400.00	333.50	450.20	0.0022212	35.057	36.391	76.858	56.552	249.04	-53.137	0.37163	supercritical
-400.00	335.00	452.78	0.0022086	34.998	36.331	76.760	56.412	244.36	-53.409	0.37293	supercritical
-400.00	336.50	455.29	0.0021964	34.941	36.273	76.665	56.277	239.94	-53.675	0.37419	supercritical
-400.00	338.00	457.72	0.0021847	34.886	36.217	76.573	56.148	235.77	-53.934	0.37544	supercritical
-400.00	339.50	460.08	0.0021735	34.833	36.162	76.483	56.024	231.83	-54.185	0.37667	supercritical
-400.00	341.00	462.38	0.0021627	34.781	36.110	76.396	55.904	228.09	-54.431	0.37788	supercritical
-400.00	342.50	464.61	0.0021523	34.731	36.059	76.312	55.789	224.55	-54.671	0.37907	supercritical

-400.00	344.00	466.79	0.0021423	34.682	36.009	76.230	55.679	221.19	54.905	0.38024	supercritical
-400.00	345.50	468.91	0.0021326	34.634	35.961	76.150	55.572	217.99	55.134	0.38139	supercritical
-400.00	347.00	470.98	0.0021232	34.587	35.915	76.072	55.469	214.95	55.358	0.38252	supercritical
-400.00	348.50	473.00	0.0021142	34.542	35.869	75.996	55.370	212.06	55.578	0.38364	supercritical
-400.00	350.00	474.97	0.0021054	34.498	35.825	75.922	55.275	209.30	55.792	0.38474	supercritical
-400.00	351.50	476.89	0.0020969	34.454	35.782	75.850	55.182	206.66	56.003	0.38583	supercritical
-400.00	353.00	478.77	0.0020887	34.412	35.741	75.780	55.093	204.13	56.209	0.38690	supercritical
-400.00	354.50	480.62	0.0020807	34.371	35.700	75.711	55.007	201.72	56.411	0.38795	supercritical
-400.00	356.00	482.42	0.0020729	34.331	35.660	75.643	54.924	199.40	56.610	0.38899	supercritical
-400.00	357.50	484.18	0.0020653	34.291	35.621	75.578	54.843	197.18	56.805	0.39002	supercritical
-400.00	359.00	485.91	0.0020580	34.252	35.583	75.513	54.765	195.05	56.996	0.39102	supercritical
-400.00	360.50	487.61	0.0020508	34.214	35.546	75.450	54.690	192.99	57.185	0.39202	supercritical
-400.00	362.00	489.27	0.0020439	34.177	35.510	75.388	54.617	191.02	57.369	0.39300	supercritical
-400.00	363.50	490.90	0.0020371	34.141	35.475	75.327	54.546	189.12	57.551	0.39397	supercritical
-400.00	365.00	492.50	0.0020305	34.105	35.440	75.267	54.477	187.28	57.730	0.39493	supercritical
-400.00	366.50	494.07	0.0020240	34.070	35.406	75.209	54.410	185.51	57.906	0.39587	supercritical
-400.00	368.00	495.61	0.0020177	34.035	35.373	75.152	54.345	183.80	58.080	0.39680	supercritical
-400.00	369.50	497.13	0.0020116	34.002	35.341	75.095	54.282	182.15	58.251	0.39772	supercritical
-400.00	371.00	498.62	0.0020056	33.968	35.309	75.040	54.221	180.55	58.419	0.39862	supercritical
-400.00	372.50	500.08	0.0019997	33.936	35.277	74.985	54.161	179.01	58.585	0.39952	supercritical
-400.00	374.00	501.52	0.0019939	33.903	35.247	74.932	54.103	177.51	58.748	0.40040	supercritical
-400.00	375.50	502.94	0.0019883	33.872	35.217	74.879	54.047	176.06	58.909	0.40127	supercritical
-400.00	377.00	504.33	0.0019828	33.841	35.187	74.828	53.992	174.65	59.068	0.40213	supercritical
-400.00	378.50	505.71	0.0019774	33.810	35.158	74.777	53.938	173.28	59.225	0.40299	supercritical
-400.00	380.00	507.06	0.0019722	33.780	35.130	74.726	53.886	171.95	59.379	0.40383	supercritical
-400.00	381.50	508.39	0.0019670	33.750	35.102	74.677	53.835	170.67	59.532	0.40466	supercritical
-400.00	383.00	509.70	0.0019619	33.721	35.075	74.629	53.786	169.41	59.683	0.40548	supercritical
-400.00	384.50	510.99	0.0019570	33.692	35.048	74.581	53.737	168.19	59.832	0.40629	supercritical
-400.00	386.00	512.26	0.0019521	33.664	35.021	74.534	53.690	167.01	59.978	0.40709	supercritical
-400.00	387.50	513.52	0.0019473	33.636	34.995	74.487	53.644	165.85	60.124	0.40788	supercritical
-400.00	389.00	514.76	0.0019427	33.608	34.970	74.441	53.599	164.73	60.267	0.40867	supercritical
-400.00	390.50	515.98	0.0019381	33.581	34.945	74.396	53.555	163.63	60.409	0.40944	supercritical
-400.00	392.00	517.18	0.0019336	33.554	34.920	74.352	53.513	162.57	60.549	0.41021	supercritical
-400.00	393.50	518.37	0.0019291	33.528	34.895	74.308	53.471	161.52	60.687	0.41097	supercritical
-400.00	395.00	519.54	0.0019248	33.502	34.872	74.264	53.430	160.51	60.824	0.41172	supercritical

-400.00	396.50	520.70	0.0019205	33.476	34.848	74.221	53.390	159.52	60.959	0.41246	supercritical
-400.00	398.00	521.84	0.0019163	33.451	34.825	74.179	53.350	158.55	61.093	0.41319	supercritical
-400.00	399.50	522.97	0.0019122	33.426	34.802	74.138	53.312	157.61	61.226	0.41392	supercritical
-400.00	401.00	524.08	0.0019081	33.401	34.779	74.096	53.274	156.68	61.357	0.41464	supercritical
-400.00	402.50	525.18	0.0019041	33.376	34.757	74.056	53.238	155.78	61.486	0.41535	supercritical
-400.00	404.00	526.27	0.0019002	33.352	34.735	74.016	53.202	154.90	61.615	0.41605	supercritical
-400.00	405.50	527.34	0.0018963	33.328	34.714	73.976	53.167	154.04	61.742	0.41675	supercritical
-400.00	407.00	528.40	0.0018925	33.305	34.692	73.937	53.132	153.20	61.867	0.41744	supercritical
-400.00	408.50	529.45	0.0018888	33.281	34.671	73.898	53.098	152.37	61.992	0.41813	supercritical
-400.00	410.00	530.49	0.0018851	33.258	34.651	73.860	53.065	151.57	62.115	0.41881	supercritical
-400.00	411.50	531.51	0.0018814	33.236	34.630	73.822	53.032	150.78	62.237	0.41948	supercritical
-400.00	413.00	532.52	0.0018779	33.213	34.610	73.785	53.001	150.01	62.358	0.42014	supercritical
-400.00	414.50	533.53	0.0018743	33.191	34.590	73.748	52.969	149.25	62.478	0.42080	supercritical
-400.00	416.00	534.52	0.0018709	33.169	34.571	73.711	52.939	148.51	62.597	0.42146	supercritical
-400.00	417.50	535.50	0.0018674	33.147	34.552	73.675	52.908	147.78	62.714	0.42210	supercritical
-400.00	419.00	536.47	0.0018641	33.125	34.533	73.639	52.879	147.07	62.831	0.42275	supercritical
-400.00	420.50	537.42	0.0018607	33.104	34.514	73.604	52.850	146.37	62.946	0.42338	supercritical
-400.00	422.00	538.37	0.0018574	33.083	34.495	73.569	52.821	145.69	63.061	0.42401	supercritical
-400.00	423.50	539.31	0.0018542	33.062	34.477	73.534	52.793	145.02	63.174	0.42464	supercritical
-400.00	425.00	540.24	0.0018510	33.042	34.459	73.500	52.766	144.36	63.286	0.42526	supercritical
-400.00	426.50	541.16	0.0018479	33.021	34.441	73.466	52.739	143.72	63.398	0.42587	supercritical
-400.00	428.00	542.07	0.0018448	33.001	34.423	73.432	52.712	143.09	63.509	0.42648	supercritical
-400.00	429.50	542.98	0.0018417	32.981	34.406	73.399	52.686	142.47	63.618	0.42709	supercritical
-400.00	431.00	543.87	0.0018387	32.961	34.389	73.366	52.661	141.86	63.727	0.42769	supercritical
-400.00	432.50	544.75	0.0018357	32.941	34.372	73.333	52.635	141.26	63.835	0.42829	supercritical
-400.00	434.00	545.63	0.0018327	32.922	34.355	73.301	52.611	140.67	63.942	0.42888	supercritical
-400.00	435.50	546.50	0.0018298	32.903	34.338	73.269	52.586	140.09	64.048	0.42946	supercritical
-400.00	437.00	547.36	0.0018270	32.883	34.322	73.237	52.562	139.53	64.153	0.43005	supercritical
-400.00	438.50	548.21	0.0018241	32.865	34.306	73.206	52.539	138.97	64.258	0.43062	supercritical
-400.00	440.00	549.06	0.0018213	32.846	34.289	73.174	52.516	138.42	64.362	0.43120	supercritical
-400.00	441.50	549.89	0.0018185	32.827	34.274	73.144	52.493	137.89	64.465	0.43177	supercritical
-400.00	443.00	550.72	0.0018158	32.809	34.258	73.113	52.470	137.36	64.567	0.43233	supercritical
-400.00	444.50	551.54	0.0018131	32.791	34.242	73.083	52.448	136.84	64.668	0.43289	supercritical
-400.00	446.00	552.36	0.0018104	32.772	34.227	73.053	52.426	136.33	64.769	0.43345	supercritical
-400.00	447.50	553.16	0.0018078	32.755	34.212	73.023	52.405	135.83	64.869	0.43400	supercritical

400.00	449.00	553.96	0.0018052	32.737	34.197	72.993	52.384	135.34	64.968	0.43455	supercritical
400.00	450.50	554.76	0.0018026	32.719	34.182	72.964	52.363	134.85	65.067	0.43509	supercritical
400.00	452.00	555.54	0.0018000	32.702	34.167	72.935	52.342	134.37	65.164	0.43564	supercritical
400.00	453.50	556.32	0.0017975	32.684	34.153	72.906	52.322	133.90	65.262	0.43617	supercritical
400.00	455.00	557.10	0.0017950	32.667	34.139	72.878	52.302	133.44	65.358	0.43671	supercritical
400.00	456.50	557.87	0.0017925	32.650	34.124	72.849	52.283	132.99	65.454	0.43724	supercritical
400.00	458.00	558.63	0.0017901	32.633	34.110	72.821	52.263	132.54	65.549	0.43777	supercritical
400.00	459.50	559.38	0.0017877	32.616	34.096	72.793	52.244	132.10	65.644	0.43829	supercritical
400.00	461.00	560.13	0.0017853	32.600	34.083	72.766	52.225	131.66	65.738	0.43881	supercritical
400.00	462.50	560.87	0.0017829	32.583	34.069	72.738	52.207	131.23	65.831	0.43933	supercritical
400.00	464.00	561.61	0.0017806	32.567	34.055	72.711	52.188	130.81	65.924	0.43984	supercritical
400.00	465.50	562.34	0.0017783	32.551	34.042	72.684	52.170	130.40	66.016	0.44035	supercritical
400.00	467.00	563.07	0.0017760	32.535	34.029	72.657	52.153	129.99	66.107	0.44086	supercritical
400.00	468.50	563.79	0.0017737	32.519	34.016	72.631	52.135	129.59	66.198	0.44136	supercritical
400.00	470.00	564.51	0.0017715	32.503	34.003	72.604	52.118	129.19	66.289	0.44186	supercritical
400.00	471.50	565.22	0.0017692	32.487	33.990	72.578	52.101	128.80	66.378	0.44236	supercritical
400.00	473.00	565.92	0.0017670	32.471	33.977	72.552	52.084	128.42	66.468	0.44286	supercritical
400.00	474.50	566.62	0.0017649	32.456	33.964	72.526	52.067	128.04	66.556	0.44335	supercritical
400.00	476.00	567.31	0.0017627	32.440	33.952	72.501	52.051	127.66	66.645	0.44384	supercritical
400.00	477.50	568.00	0.0017606	32.425	33.940	72.475	52.035	127.29	66.732	0.44433	supercritical
400.00	479.00	568.69	0.0017584	32.410	33.927	72.450	52.019	126.93	66.819	0.44481	supercritical
400.00	480.50	569.37	0.0017563	32.395	33.915	72.425	52.003	126.57	66.906	0.44529	supercritical
400.00	482.00	570.04	0.0017543	32.380	33.903	72.400	51.987	126.22	66.992	0.44577	supercritical
400.00	483.50	570.71	0.0017522	32.365	33.891	72.375	51.972	125.87	67.078	0.44625	supercritical
400.00	485.00	571.38	0.0017502	32.350	33.879	72.351	51.957	125.52	67.163	0.44672	supercritical
400.00	486.50	572.04	0.0017481	32.336	33.868	72.326	51.941	125.18	67.248	0.44719	supercritical
400.00	488.00	572.69	0.0017461	32.321	33.856	72.302	51.927	124.85	67.332	0.44766	supercritical
400.00	489.50	573.34	0.0017442	32.307	33.845	72.278	51.912	124.52	67.416	0.44812	supercritical
400.00	491.00	573.99	0.0017422	32.292	33.833	72.254	51.898	124.19	67.499	0.44859	supercritical
400.00	492.50	574.63	0.0017402	32.278	33.822	72.230	51.883	123.87	67.582	0.44905	supercritical
400.00	494.00	575.27	0.0017383	32.264	33.811	72.207	51.869	123.55	67.664	0.44951	supercritical
400.00	495.50	575.91	0.0017364	32.250	33.800	72.183	51.855	123.24	67.746	0.44996	supercritical
400.00	497.00	576.54	0.0017345	32.236	33.789	72.160	51.841	122.93	67.828	0.45042	supercritical
400.00	498.50	577.17	0.0017326	32.222	33.778	72.137	51.828	122.62	67.909	0.45087	supercritical
400.00	500.00	577.79	0.0017307	32.208	33.767	72.114	51.814	122.32	67.990	0.45132	supercritical

VITA

Mr. Sittidej Sittipraneed was born on September 16, 1980 in Bangkok, Thailand. He studied both primary and secondary educations at Chulalongkorn University Demonstration School. In 2001, he received the Bachelor Degree of Engineering (Chemical Engineering) from King Mongkut's Institute of Technology North Bangkok. Then, he continued to study in Master Degree program at Chemical Engineering Department, Engineering Faculty, Chulalongkorn University with the master thesis entitled "Preparation and Characterization of Activated Carbon from Anthracite Powder by Hydrothermal Treatment".



ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย