Supplements

Table S.1 Thermophysical properties of air
(based on data of Ref. [75])

T_f, K	ρ, kg/m^3		$c_p \times 10^{-3}$, J/(kg·K)		λ, W/(m·K)	
$p \times 10^{-5}$, Pa	1	10	1	10	1	10
250	1.395	14.06	1.006	1.028	22.28	22.88
260	1.341	13.49	1.006	1.026	23.11	23.69
270	1.291	12.97	1.006	1.024	23.93	24.49
280	1.245	12.50	1.006	1.023	24.74	25.28
290	1.202	12.05	1.006	1.022	25.53	26.05
300	1.161	11.64	1.007	1.021	26.31	26.81
310	1.124	11.25	1.007	1.020	27.08	27.56
320	1.089	10.89	1.007	1.020	27.84	28.31
330	1.056	10.56	1.008	1.019	28.59	29.04
340	1.025	10.24	1.009	1.019	29.33	29.77
350	0.995	9.95	1.009	1.019	30.36	30.49
360	0.968	9.68	1.010	1.019	30.77	31.19
370	0.942	9.41	1.011	1.020	31.48	31.89
380	0.917	9.16	1.012	1.020	32.20	32.59
390	0.894	8.92	1.013	1.021	32.91	33.29
400	0.871	8.69	1.014	1.021	33.62	33.99
410	0.851	8.48	1.015	1.022	34.31	34.67
420	0.830	8.28	1.016	1.023	35.00	35.35
430	0.811	8.09	1.018	1.025	35.68	36.03
440	0.792	7.90	1.019	1.026	36.37	36.70
450	0.774	7.72	1.021	1.027	37.05	37.38
460	0.758	7.55	1.023	1.028	37.71	38.04
470	0.741	7.39	1.024	1.029	38.37	38.69
480	0.726	7.24	1.026	1.031	39.03	39.35
490	0.711	7.09	1.028	1.032	39.70	40.00
500	0.696	6.94	1.030	1.034	40.36	40.66
510	0.684	6.82	1.032	1.036	41.00	41.29
520	0.671	6.69	1.034	1.038	41.63	41.92
530	0.658	6.56	1.036	1.040	42.27	42.55
540	0.646	6.44	1.038	1.042	42.90	43.18
550	0.633	6.31	1.040	1.044	43.54	43.81
560	0.622	6.20	1.042	1.046	44.15	44.42
570	0.612	6.10	1.044	1.048	44.76	45.03
580	0.601	5.99	1.047	1.051	45.38	45.63
590	0.591	5.89	1.049	1.053	45.99	46.24
600	0.580	5.78	1.051	1.055	46.60	46.85

Table S.1 *Continued*

μ, N·s/m²		$i\times10^{-3}$, J/kg		Pr	T_f, K
1	10	1	10	1–10	$p\times10^{-5}$, Pa
15.96	16.12	250.0	247.0	0.723	250
16.46	16.62	260.0	257.3	0.719	260
16.96	17.11	270.1	267.6	0.714	270
17.46	17.60	280.2	277.8	0.711	280
17.96	18.10	290.2	288.0	0.709	290
18.46	18.59	300.3	298.3	0.708	300
18.96	19.10	310.4	305.8	0.706	310
19.45	19.58	320.4	318.7	0.705	320
19.92	20.04	330.5	328.9	0.703	330
20.38	20.49	340.6	339.1	0.701	340
20.82	20.93	350.7	349.2	0.699	350
21.26	21.37	360.8	359.4	0.698	360
21.69	21.80	370.9	369.6	0.697	370
22.13	22.24	381.0	379.8	0.696	380
22.57	22.67	391.1	390.0	0.695	390
23.01	23.11	401.2	400.2	0.694	400
23.42	23.52	411.4	410.4	0.693	410
23.83	23.93	421.6	420.7	0.693	420
24.25	24.34	431.8	430.9	0.692	430
24.66	24.75	441.9	441.2	0.692	440
25.07	25.16	452.1	451.4	0.691	450
25.46	25.55	462.3	461.7	0.691	460
25.85	25.93	472.6	472.0	0.690	470
26.23	26.32	482.8	482.3	0.690	480
26.62	26.70	493.1	492.6	0.689	490
27.01	27.09	503.4	502.9	0.689	500
27.38	27.45	513.8	513.3	0.689	510
27.74	27.82	524.1	523.7	0.689	520
28.11	28.18	534.5	534.1	0.689	530
28.47	28.55	544.8	544.5	0.689	540
28.84	28.91	555.2	554.9	0.689	550
29.19	29.26	565.7	565.4	0.689	560
29.54	29.60	576.1	575.9	0.689	570
29.88	29.95	586.6	586.3	0.690	580
30.23	30.29	597.0	596.8	0.690	590
30.58	30.64	607.5	607.3	0.690	600

Table S.1 *Continued*

T_f, K	ρ, kg/m³		$c_p \times 10^{-3}$, J/(kg·K)		λ, W/(m·K)	
$p \times 10^{-5}$, Pa	1	10	1	10	1	10
610	0.571	5.70	1.053	1.057	47.19	47.43
620	0.563	5.61	1.056	1.059	47.77	48.01
630	0.554	5.52	1.058	1.062	48.36	48.60
640	0.545	5.43	1.061	1.064	48.94	49.18
650	0.536	5.34	1.063	1.066	49.53	49.76
660	0.528	5.26	1.065	1.068	50.09	50.32
670	0.520	5.19	1.068	1.070	50.65	50.88
680	0.513	5.11	1.070	1.073	51.22	51.43
690	0.505	5.03	1.073	1.075	51.78	51.99
700	0.498	4.96	1.075	1.077	52.34	52.55
710	0.491	4.89	1.077	1.079	52.88	53.09
720	0.484	4.83	1.080	1.082	53.45	53.63
730	0.478	4.76	1.082	1.084	53.96	54.16
740	0.471	4.69	1.085	1.087	54.50	54.70
750	0.464	4.63	1.087	1.089	55.04	55.24
760	0.459	4.57	1.089	1.091	55.57	55.76
770	0.453	4.51	1.092	1.093	56.10	56.29
780	0.447	4.45	1.094	1.096	56.62	56.81
790	0.441	4.40	1.097	1.098	57.15	57.34
800	0.435	4.34	1.099	1.100	57.68	57.86
810	0.430	4.29	1.101	1.102	58.20	58.38
820	0.425	4.24	1.103	1.104	58.72	58.90
830	0.420	4.19	1.106	1.107	59.25	59.42
840	0.415	4.13	1.108	1.109	59.77	59.94
850	0.410	4.08	1.110	1.111	60.29	60.46
860	0.405	4.04	1.112	1.113	60.81	60.98
870	0.401	3.99	1.114	1.115	61.33	61.50
880	0.396	3.95	1.117	1.118	61.85	62.01
890	0.391	3.90	1.119	1.120	62.37	62.53
900	0.387	3.86	1.121	1.122	62.89	63.05
910	0.383	3.82	1.123	1.124	63.41	63.57
920	0.379	3.78	1.125	1.126	63.93	64.09
930	0.375	3.74	1.127	1.128	64.45	64.60
940	0.371	3.70	1.129	1.130	64.97	65.12
950	0.367	3.65	1.131	1.132	65.49	65.64
960	0.363	3.62	1.133	1.134	66.01	66.16
970	0.359	3.58	1.135	1.136	66.53	66.68
980	0.356	3.54	1.137	1.138	67.04	67.19
990	0.352	3.51	1.139	1.140	67.56	67.71
1000	0.348	3.47	1.141	1.142	68.08	68.23

Table S.1 *Continued*

μ, N·s/m²		$i\times10^{-3}$, J/kg		Pr	T_f, K
1	10	1	10	1–10	$p\times10^{-5}$, Pa
30.91	30.97	618.1	617.9	0.690	610
31.25	31.31	628.6	628.5	0.691	620
31.58	31.64	639.2	639.1	0.691	630
31.92	31.98	649.7	649.7	0.692	640
32.25	32.31	660.3	660.3	0.692	650
32.58	32.64	671.0	671.0	0.693	660
32.90	32.96	681.7	681.7	0.694	670
33.23	33.29	692.4	692.5	0.695	680
33.55	33.61	703.1	703.2	0.695	690
33.88	33.94	713.8	713.9	0.696	700
34.20	34.25	724.6	724.7	0.697	710
34.51	34.57	735.4	735.5	0.698	720
34.83	34.88	746.3	746.4	0.698	730
35.14	35.20	757.1	757.2	0.699	740
35.46	35.51	767.9	768.0	0.700	750
35.76	35.81	778.8	778.9	0.701	760
36.07	36.12	789.7	789.9	0.702	770
36.37	36.42	800.7	800.8	0.703	780
36.68	36.73	811.6	811.8	0.704	790
36.98	37.03	822.5	822.7	0.705	800
37.27	37.32	833.5	833.8	0.705	810
37.56	37.61	844.6	844.8	0.706	820
37.85	37.90	855.6	855.9	0.707	830
38.14	38.19	866.7	866.9	0.707	840
38.43	38.48	877.7	878.0	0.708	850
38.71	38.75	888.9	889.2	0.708	860
38.98	39.03	900.0	900.4	0.708	870
39.26	39.30	911.2	911.5	0.709	880
39.53	39.58	922.3	922.7	0.709	890
39.81	39.85	933.5	933.9	0.710	900
40.08	40.12	944.8	945.2	0.710	910
40.35	40.39	956.0	956.5	0.710	920
40.61	40.65	967.3	967.7	0.710	930
40.88	40.92	978.5	979.0	0.710	940
41.15	41.19	989.8	990.3	0.711	950
41.41	41.45	1001.2	1001.7	0.711	960
41.67	41.71	1012.5	1013.1	0.711	970
41.92	41.96	1023.9	1024.4	0.711	980
42.18	42.22	1035.2	1035.8	0.711	990
42.44	42.48	1046.6	1047.2	0.711	1000

Table S.2
Hydraulic resistance of a 19-rod assembly with $s/d = 1.35$
(in assemblies Nos. 1 and 2, Table 5.1)

$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$	$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$
Assembly of smooth rods							
with no spacer grid				between spacer grids			
1.023	0.0147	0.04	7.185	1.032	0.00614	0.0166	8.948
1.287	0.0314	0.0858	4.213	1.008	0.0146	0.0397	4.77
1.175	0.0386	0.106	3.146	1.24	0.0308	0.0844	3.165
1.875	0.0625	0.1713	2.887	1.151	0.0385	0.106	3.196
3.167	0.0106	0.2944	2.253	1.931	0.0638	0.176	2.563
1.234	0.1518	0.4214	2.011	2.877	0.0103	0.286	2.075
4.899	0.1649	0.458	2.172	1.187	0.2294	0.612	2.161
1.180	0.222	0.5858	2.025	2.006	0.3512	0.9229	1.083
1.999	0.3474	0.9094	2.044	3.244	0.5871	1.518	1.694
5.092	0.5571	1.44	1.89	4.07	0.842	2.106	1.636
3.242	0.383	1.5	1.894	–	–	–	–
Assembly of rough rods ($k/d = 0.005$)							
1.014	0.0069	0.019	5.99	1.215	0.225	0.589	2.729
1.038	0.0140	0.038	4.378	2.051	0.339	0.871	2.732
1.186	0.0351	0.096	3.08	3.046	0.603	1.519	2.903
1.689	0.0801	0.221	2.417	3.949	0.784	1.955	2.822

Table S.3
Hydraulic resistance of an 85-rod assembly with $s/d = 1.23$ and wire wrapping

$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$	$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$
4-start wrapping with $T/d = 69.8$ (assembly No. 6, Table 5.2)							
1.141	0.1061	0.483	3.480	3.378	0.2993	1.460	2.820
1.144	0.1056	0.491	3.940	3.353	0.3038	1.533	3.036
1.134	0.1100	0.528	3.804	2.582	0.5244	2.346	2.782
1.142	0.1107	0.538	3.781	2.573	0.5266	2.374	2.785
1.116	0.1083	0.542	3.887	2.638	0.5445	2.449	2.581
1.310	0.1713	0.774	3.087	2.565	0.5524	2.616	2.678

Table S.3 *Continued*

$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$	$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$
1.319	0.1720	0.803	3.382	2.435	0.7884	3.623	2.535
1.292	0.1704	0.826	3.371	2.650	0.8646	3.910	2.337
1.309	0.1757	0.856	3.318	2.900	0.9432	4.050	2.410
1.305	0.1705	0.863	2.670	2.891	0.9555	4.300	2.402
1.408	0.2063	1.007	3.258	2.861	0.9532	4.450	2.457
1.504	0.2289	1.051	3.010	2.882	0.9727	4.495	2.348
1.508	0.2262	1.057	3.149	3.187	1.033	4.558	2.452
1.489	0.2324	1.139	3.180	3.095	1.023	4.642	2.446
1.469	0.2332	1.186	3.153	3.168	1.049	4.745	2.394
3.408	0.2728	1.234	2.810	3.147	1.054	4.867	2.408
3.406	0.2790	1.288	2.998	3.153	1.064	4.871	2.343
3.399	0.2916	1.445	2.841	–	–	–	–
2-start wrapping with T/d = 69.8 (assembly No. 7, Table 5.2)							
1.017	0.0858	0.470	4.39	2.532	0.555	3.030	2.69
1.038	0.1022	0.545	4.06	2.281	0.711	3.622	2.98
1.026	0.1038	0.601	4.09	2.317	0.716	3.750	2.96
1.245	0.1528	0.815	3.53	2.254	0.726	3.929	2.72
1.214	0.1526	0.848	3.60	2.499	0.788	4.032	2.96
1.215	0.1541	0.894	3.62	2.632	0.780	4.105	3.12
1.504	0.2314	1.254	3.23	2.469	0.805	4.315	2.67
1.459	0.2330	1.285	2.75	2.898	0.953	4.926	2.84
1.459	0.2308	1.345	3.36	2.843	0.945	5.031	2.40
2.530	0.3268	1.659	3.09	3.125	1.002	5.368	3.12
2.418	0.3224	1.730	3.15	3.005	1.043	5.432	2.55
2.438	0.5356	2.670	3.13	3.004	1.050	5.558	2.529
2.452	0.5489	2.829	3.09	3.053	1.078	5.751	2.47
2-start wrapping with T/d = 28 (assembly No. 7, Table 5.2)							
1.039	0.1008	0.555	4.62	2.724	0.5848	3.047	2.84
1.044	0.1032	0.565	4.20	2.184	0.7146	3.760	2.69
1.018	0.0998	0.568	4.23	2.140	0.7092	3.888	2.70
1.285	0.174	0.954	3.50	2.235	0.7222	3.985	2.68
1.299	0.1751	0.958	3.58	2.466	0.8072	4.205	2.66
1.252	0.1730	1.008	3.48	2.457	0.8147	4.270	2.65
1.494	0.2414	1.289	3.13	2.392	0.8003	4.325	2.71
1.504	0.2418	1.326	3.25	2.798	0.9444	4.926	2.57

Table S.3 *Continued*

$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$	$p_{en}\times10^{-5}$, Pa	G, kg/s	$\mathrm{Re}\times10^{-5}$	$\xi\times10^{2}$
1.455	0.2350	1.373	3.44	2.782	0.9439	4.950	2.59
1.502	0.2383	1.427	3.46	2.612	0.9248	4.979	2.53
2.375	0.3280	1.673	3.21	2.719	0.9312	5.049	2.63
2.380	0.3284	1.688	3.27	2.982	1.072	5.750	2.23
2.248	0.3268	1.810	3.18	3.057	1.095	5.790	2.57
2.455	0.5449	2.958	2.93	3.062	1.102	5.863	2.55
2.768	0.5849	2.974	2.82	–	–	–	–
2-start wrapping with $T/d = 14$ (assembly No. 7, Table 5.2)							
1.044	0.0984	0.519	5.10	2.231	0.7120	3.655	2.90
1.043	0.0991	0.521	5.24	2.327	0.7227	3.900	2.96
1.295	0.1690	0.889	4.21	2.477	0.8176	4.202	3.00
1.302	0.1702	0.901	4.22	2.488	0.8204	4.342	2.87
1.469	0.2205	1.165	3.88	2.456	0.8217	4.449	2.87
1.470	0.2224	1.200	3.91	2.809	0.9360	4.865	2.82
2.302	0.3240	1.619	3.24	2.774	0.9502	4.949	2.91
2.311	0.3400	1.782	3.23	2.738	0.9387	5.146	2.80
2.353	0.5176	2.776	3.19	3.007	1.063	5.585	2.77
2.353	0.5522	2.803	3.31	3.054	1.076	5.643	2.78
2.309	0.5679	2.930	3.06	3.098	1.111	6.176	2.81
2.168	0.6983	3.550	3.03	–	–	–	–
Oppositely directed wrapping (assembly No. 8, Table 5.2): with 2-start (right hand) wrapping, $T/d = 10$, and with 4-start (left hand) wrapping, $T/d = 20$							
1.062	0.0940	0.476	6.15	2.561	0.5387	2.590	3.21
1.063	0.1022	0.497	5.08	2.554	0.5418	2.662	3.35
1.052	0.0987	0.519	5.16	2.591	0.5628	2.787	3.09
1.288	0.1638	0.803	4.39	2.288	0.6707	3.281	3.22
1.283	0.1636	0.808	4.32	2.347	0.6764	3.317	3.31
1.245	0.1587	0.835	4.32	2.340	0.7052	3.404	3.00
1.519	0.2294	1.116	4.05	2.696	0.7923	3.806	3.23
1.504	0.2309	1.137	3.87	2.721	0.7967	3.879	3.31
1.445	0.2247	1.183	3.90	2.750	0.8174	4.013	3.25
2.318	0.2876	1.390	3.17	3.224	1.017	4.839	3.08
2.580	0.2969	1.420	3.67	3.360	1.027	5.035	3.18
2.282	0.3243	1.530	3.28	3.367	1.039	5.120	3.11

Table S.4
Local resistance of spacer grids
(Fig. 5.6, and assemblies Nos. 1 and 2 in Table 5.1)

Experiment	$Re \times 10^{-5}$	No. of spacer grid				
		1	2	3	4	5
		In assembly of smooth rods				
PMG-0-0014	2.125	0.262	0.286	0.278	0.272	0.271
PMG-0-0015	1.518	0.245	0.256	0.252	0.248	0.247
PMG-0-0017	0.612	0.273	0.287	0.284	0.277	0.276
PMG-0-0018	0.415	0.305	0.324	0.346	0.317	0.316
PMG-0-0019	0.106	0.361	0.404	0.393	0.371	0.370
PMG-0-0020	0.176	–	0.347	0.333	0.292	0.290
PMG-0-0021	0.286	0.269	–	0.263	0.271	0.270
PMG-0-0022	2.106	0.236	0.258	0.275	0.238	0.236
PMG-0-0023	0.084	0.423	0.409	0.449	0.450	–
PMG-0-0024	0.040	–	–	0.683	0.642	0.641
PMG-0-0025	0.017	–	–	1.245	1.155	1.168
PMG-0-0026	0.013	–	–	1.694	1.282	1.503
		In assembly of rough rods				
MPSh-0-1001	1.955	0.195	0.239	0.245	0.258	0.257
MPSh-0-1002	0.519	0.208	0.258	0.250	0.247	0.246
MPSh-0-1003	0.871	0.195	0.251	0.255	0.256	0.255
MPSh-0-1004	0.589	0.215	0.255	0.263	0.284	0.283
MPSh-0-1005	0.221	0.249	0.243	0.308	0.373	0.372
MPSh-0-1006	0.095	0.295	0.312	0.337	0.325	0.323
MPSh-0-1007	0.038	0.425	0.584	–	0.552	0.551
MPSh-0-1008	0.019	0.843	1.311	0.734	0.959	0.900

Table S.5
Shear stresses around rods in a 19-rod assembly with $s/d = 1.35$
(assembly No. 3, Table 5.1)

$\mathrm{Re} = 0.998\times10^5$; $G = 1.173$ kg/s; $T_f = 313$ K; $p_f = 0.936\times10^5$ Pa

φ, deg	Rod No. 1		Rod No. 2		Rod No. 3		Rod No. 4	
	$\tau_{av} = 3.713$ N/m²		$\tau_{av} = 4.557$ N/m²		$\tau_{av} = 4.289$ N/m²		$\tau_{av} = 3.937$ N/m²	
	τ_w	τ_w/τ_{av}	τ_w	τ_w/τ_{av}	τ_w	τ_w/τ_{av}	τ_w	τ_w/τ_{av}
0	4.781	1.017	3.917	1.051	4.947	0.903	5.840	1.037
6	4.701	1.000	6.086	1.081	4.889	0.892	6.135	1.090
12	4.606	0.980	6.205	1.102	4.802	0.876	6.114	1.086
18	4.628	0.985	6.191	1.100	4.759	0.868	5.896	1.047
24	4.650	0.989	6.053	1.076	4.824	0.880	5.549	0.986
30	4.606	0.980	5.769	1.026	5.070	0.925	5.293	0.940
36	4.504	0.958	5.542	0.984	5.371	0.980	5.178	0.920
42	4.364	0.929	5.677	1.008	5.627	1.027	5.077	0.902
48	4.349	0.925	6.072	1.078	5.776	1.054	4.911	0.872
54	4.430	0.943	6.456	1.147	5.847	1.067	4.759	0.845
60	4.599	0.978	6.734	1.196	5.861	1.069	4.759	0.845
66	4.773	1.016	6.810	1.209	5.833	1.064	4.911	0.872
72	4.911	1.045	6.824	1.212	5.797	1.058	5.242	0.931
78	5.084	1.082	6.678	1.186	5.698	1.040	5.414	0.962
84	5.156	1.097	6.470	1.149	5.549	1.012	5.528	0.982
90	5.178	1.102	6.282	1.116	5.350	0.976	5.464	0.971
96	5.048	1.074	6.107	1.085	5.106	0.932	5.264	0.936
102	4.802	1.022	5.889	1.046	4.962	0.905	5.084	0.903
108	4.642	0.988	5.677	1.008	4.983	0.909	5.142	0.913
114	4.635	0.986	5.478	0.973	5.206	0.950	5.343	0.949
120	4.744	1.009	5.328	0.946	5.435	0.992	5.478	0.973
126	4.897	1.042	5.228	0.928	5.556	1.014	5.514	0.980
132	4.976	1.059	5.149	0.914	5.556	1.014	5.435	0.966
138	5.020	1.068	5.135	0.912	5.606	1.023	5.407	0.961
144	4.933	1.050	5.163	0.917	5.705	1.041	5.178	0.938
150	4.889	1.040	5.207	0.924	5.938	1.083	5.178	0.920
156	4.781	1.017	5.185	0.921	5.903	1.077	5.084	0.903
162	4.693	0.999	5.106	0.907	5.825	1.063	5.02	0.892
168	4.650	0.989	4.926	0.875	5.542	1.011	4.983	0.885
174	4.766	1.014	4.752	0.844	5.328	0.972	4.976	0.884
180	4.824	1.026	4.562	0.810	5.321	0.971	4.969	0.883

Table S.5 *Continued*

Re = 0,998×10⁵; G = 1,173 kg/s; T_f = 313 K; p_f = 0,936×10⁵ Pa

φ, deg	Rod No. 1 τ_{av} = 3.713 N/m²		Rod No. 2 τ_{av} = 4.557 N/m²		Rod No. 3 τ_{av} = 4.289 N/m²		Rod No. 4 τ_{av} = 3.937 N/m²	
	τ_w	τ_w/τ_{av}	τ_w	τ_w/τ_{av}	τ_w	τ_w/τ_{av}	τ_w	τ_w/τ_{av}
0	0.767	1.017	1.043	1.078	0.796	0.878	1.024	1.149
6	0.749	0.993	1.066	1.102	0.808	0.892	1.051	1.179
12	0.736	0.977	1.088	1.124	0.800	0.883	1.059	1.189
18	0.703	0.938	1.072	1.107	0.820	0.906	1.033	1.159
24	0.721	0.956	1.051	1.086	0.830	0.916	0.971	1.089
30	0.722	0.957	1.009	1.042	0.833	0.920	0.899	1.008
36	0.718	0.952	0.989	1.022	0.858	0.947	0.871	0.978
42	0.708	0.940	0.996	1.029	0.890	0.987	0.844	0.947
48	0.711	0.943	1.027	1.060	0.919	1.015	0.835	0.937
54	0.708	0.938	1.075	1.111	0.954	1.054	0.826	0.927
60	0.720	0.954	1.108	1.144	0.975	1.076	0.835	0.937
66	0.742	0.984	1.139	1.177	0.974	1.075	0.853	0.958
72	0.750	0.995	1.124	1.161	0.964	1.065	0.881	0.988
78	0.782	1.037	1.115	1.152	0.960	1.060	0.917	1.029
84	0.803	1.065	1.097	1.133	0.918	1.013	0.908	1.019
90	0.804	1.066	1.058	1.093	0.868	0.958	0.871	0.978
96	0.799	1.060	1.024	1.058	0.827	0.913	0.853	0.958
102	0.800	1.061	0.965	0.997	0.802	0.885	0.871	0.978
108	0.797	1.056	0.933	0.964	0.814	0.699	0.908	1.019
114	0.777	1.031	0.895	0.925	0.861	0.951	0.936	1.049
120	0.735	0.974	0.866	0.895	0.915	1.010	0.944	1.059
126	0.725	0.962	0.858	0.896	0.974	1.075	0.935	1.049
132	0.737	0.978	0.850	0.878	1.000	1.104	0.917	1.029
138	0.769	1.020	0.846	0.874	0.997	1.101	0.890	0.998
144	0.786	1.043	0.855	0.883	0.996	1.099	0.871	0.978
150	0.796	1.055	0.856	0.884	0.980	1.082	0.835	0.937
156	0.787	1.044	0.836	0.863	0.975	1.076	0.817	0.917
162	0.763	1.012	0.818	0.845	0.958	1.058	0.798	0.896
168	0.746	0.989	0.785	0.810	0.936	1.033	0.780	0.875
174	0.750	0.995	0.755	0.780	0.914	1.009	0.798	0.896
180	0.774	1.026	0.723	0.747	0.900	0.994	0.826	0.927

Table S.6
Average heat transfer of rods in a 19-rod smooth assembly with s/d = 1.35 (assembly No. 1 in Table 5.1, the numbering of rods is given in Fig. 5.4)

Rod No.	$p\times10^{-5}$, Pa	$T_{w_{av}}$, K	T_f, K	$q\times10^{-4}$, W/m²	α, W/(m²·K)	Nu
			Experiment MPG-0101,			
	$p_{en}=3.298\times10^5$ Pa,	$T_{en}=312.2$ K,	$G=0.545$ kg/s,	$x/d_h=100.5$,	Re$=1.316\times10^5$	
1	3.072	384.6	335.5	1.781	363.0	151.4
2	3.072	377.1	335.5	1.824	438.1	182.7
3	3.072	369.3	335.5	1.117	330.7	137.2
4	3.072	367.3	335.5	1.861	584.6	223.8
			Experiment MPG-0102,			
	$p_{en}=2.118\times10^5$ Pa,	$T_{en}=305.7$ K,	$G=0.34$ kg/s,	$x/d_h=100.5$,	Re$=0.825\times10^5$	
1	1.972	384.4	334.3	1.272	254.5	106.7
2	1.972	374.8	334.3	1.327	327.7	137.3
3	1.972	366.0	334.4	1.474	457.2	191.6
4	1.972	365.2	334.3	1.346	435.4	182.5
			Experiment MPG-0103,			
	$p_{en}=1.103\times10^5$ Pa,	$T_{en}=304.6$ K,	$G=0.223$ kg/s,	$x/d_h=100.5$,	Re$=0.544\times10^5$	
1	0.990	379.7	330.5	0.875	181.8	76.85
2	0.990	370.3	331.5	0.612	157.7	66.69
3	0.990	362.7	331.5	0.930	297.8	125.9
4	0.990	360.5	331.5	0.862	297.5	125.2
			Experiment MPG-0104,			
	$p_{en}=4.253\times10^5$ Pa,	$T_{en}=320.3$ K,	$G=0.829$ kg/s,	$x/d_h=100.5$,	Re$=1.975\times10^5$	
1	3.837	388.8	341.3	2.671	562.0	230.7
2	3.837	381.6	341.3	2.125	527.3	216.5
3	3.837	373.7	341.3	2.221	686.0	281.6
4	3.837	372.6	341.3	2.391	764.8	313.9
			Experiment MPG-0105,			
	$p_{en}=1.220\times10^5$ Pa,	$T_{en}=291.9$ K,	$G=0.1428$ kg/s,	$x/d_h=100.5$,	Re$=0.360\times10^5$	
1	1.156	360.6	318.1	0.502	118.2	51.77

Table S.6 *Continued*

Rod No.	$p\times10^{-5}$, Pa	$T_{w_{av}}$, K	T_f, K	$q\times10^{-4}$, W/m^2	α, W/(m^2·K)	Nu
2	1.156	349.1	318.1	0.492	158.7	69.52
3	1.156	339.9	318.1	0.492	226.1	99.04
4	1.156	340.2	318.1	0.492	222.5	97.47
			Experiment MPG-0106,			
$p_{en}=3.192\times10^5$ Pa, $T_{en}=283.4$ K, $G=0{,}0963$ kg/s, $x/d_h=100.5$, Re $=0.247\times10^5$						
1	3.184	349.5	311.2	0.364	94.99	42.25
2	3.184	341.3	311.2	0.364	120.8	53.72
3	3.184	334.2	311.2	0.368	160.0	71.17
4	3.184	331.5	311.2	0.376	184.5	82.87
			Experiment MPG-0107,			
$p_{en}=1.181\times10^5$ Pa, $T_{en}=288.0$ K, $G=0.0396$ kg/s, $x/d_h=100.5$, Re $=0.10\times10^5$						
1	1.176	347.4	315.2	0.161	50.07	22.10
2	1.176	340.7	315.2	0.147	57.74	25.49
3	1.176	333.5	315.2	0.139	76.05	33.58
4	1.176	331.4	315.2	0.151	93.44	41.26
			Experiment MPG-0108,			
$p_{en}=1.24\times10^5$ Pa, $T_{en}=289.0$ K, $G=0.0281$ kg/s, $x/d_h=100.5$, Re $=0.071\times10^5$						
1	1.239	348.2	317.6	0.121	39.38	17.27
2	1.239	341.5	317.6	0.111	46.35	20.33
3	1.239	334.2	317.6	0.107	64.13	28.13
4	1.239	332.7	317.6	0.115	75.78	33.24
			Experiment MPG-0109,			
$p_{en}=1.975\times10^5$ Pa, $T_{en}=286.8$ K, $G=0.0604$ kg/s, $x/d_h=100.5$, Re $=0.153\cdot10^5$						
1	1.969	350.8	314.8	0.260	72.22	31.88
2	1.969	343.2	314.8	0.231	81.20	35.84
3	1.969	336.2	314.8	0.250	116.8	51.57
4	1.969	333.6	314.8	0.238	126.0	55.93

Table S.7
Average heat transfer in a 19-rod rough assembly with $s/d = 1.35$
(assembly No. 2 in Table 5.1, the numbering of rods is given in Fig. 5.4)

Rod No.	$p\times10^{-5}$, Pa	$T_{w_{av}}$, K	T_f, K	$q\times10^{-4}$, W/m²	α, W/(m²·K)	Nu
			Experiment MPSh-0121,			
			$p_{en}=4.484\times10^5$ Pa, $T_{en}=329.0$ K, $G=0.783$ kg/s, $x/d_h=100.5$, Re $=1.730\cdot10^5$			
1	3.735	452.9	377.8	5.206	693.4	261.7
2	3.735	432.8	377.8	5.231	950.3	358.6
3	3.735	409.1	377.8	5.173	1654	624.3
4	3.735	414.1	377.8	5.225	1439	543.0
			Experiment MPSh-0122,			
			$p_{en}=3.266\cdot10^5$ Pa, $T_{en}=321.4$ K, $G=0.516$ kg/s, $x/d_h=100.5$, Re$=1.172\cdot10^5$			
1	2.867	431.6	364.3	2.984	443.5	172.7
2	2.867	413.5	364.3	3.012	612.7	238.6
3	2.867	394.0	364.3	2.995	1010	393.2
4	2.867	396.5	364.3	3.047	948.1	369.2
			Experiment MPSh-0123,			
			$p_{en}=2.301\cdot10^5$ Pa, $T_{en}=314.0$ K, $G=0.348$ kg/s, $x/d_h=100.5$, Re$=0.811\cdot10^5$			
1	2.058	409.1	352.6	2.072	366.8	146.9
2	2.058	393.8	352.6	1.827	443.4	177.6
3	2.058	376.4	352.6	1.824	765.6	306.7
4	2.058	380.3	352.6	1.845	666.5	267.2
			Experiment MPSh-0124,			
			$p_{en}=1.366\cdot10^5$ Pa, $T_{en}=310.8$ K, $G=0.223$ kg/s, $x/d_h=100.5$, Re$=0.506\cdot10^5$			
1	1.194	444.0	365.1	1.649	209.2	81.51
2	1.194	419.8	365.1	1.699	310.8	121.1
3	1.194	397.3	365.1	1.693	526.1	205.0
4	1.194	402.1	365.1	1.721	465.3	181.3

Table S.7 *Continued*

Rod No.	$p\times10^{-5}$, Pa	$T_{w_{av}}$, K	T_f, K	$q\times10^{-4}$, W/m²	α, W/(m²·K)	Nu
Experiment MPSh-0125, $p_{en}=3.099\cdot10^5$ Pa, $T_{en}=290.8$ K, $G=0.0893$ kg/s, $x/d_h=100.5$, $\mathrm{Re}=0.210\cdot10^5$						
1	3.087	420.4	348.8	0.753	105.2	42.44
2	3.087	400.1	348.8	0.756	147.4	59.58
3	3.087	381.0	348.8	0.753	233.8	94.36
4	3.087	383.8	348.8	0.758	216.7	87.43
Experiment MPSh-0127, $p_{en}=1.229\cdot10^5$ Pa, $T_{en}=291.7$ K, $G=0.0421$ kg/s, $x/d_h=100.5$, $\mathrm{Re}=0.098\cdot10^5$						
1	1.221	418.3	352.3	0.369	55.85	22.41
2	1.221	399.5	352.3	0.368	77.87	31.25
3	1.221	381.0	352.3	0.367	128.3	51.48
4	1.221	383.8	352.3	0.372	118.1	47.41
Experiment MPSh-0128. $p_{en}=1.281\times10^5$ Pa, $T_{en}=292.0$ K, $G=0.0286$ kg/s, $x/d_h=100.5$, $\mathrm{Re}=0.068\times10^5$						
1	1.278	405.0	346.1	0.211	35.85	14.60
2	1.278	389.2	346.1	0.213	49.41	20.13
3	1.278	372.3	346.1	0.213	81.12	33.04
4	1.278	375.0	346.1	0.215	74.43	30.32
Experiment MPSh-0129, $p_{en}=1.006\times10^5$ Pa, $T_{en}=292.8$ K, $G=0.0132$ kg/s, $x/d_h=100.5$, $\mathrm{Re}=0.030\times10^5$						
1	1.004	419.5	362.5	0.127	22.36	8.769
2	1.004	401.9	362.5	0.126	31.86	12.49
3	1.004	383.0	362.5	0.129	62.71	24.59
4	1.004	386.9	362.5	0.131	53.50	20.98

Table S.8

Local heat transfer of rods in an 85-rod assembly with $s/d = 1.35$ and wire wrapping with $T/d = 14$ in stabilized flow region in cross section at a distance of 1.259 m from assembly inlet (Assembly No. 7 in Table 5.2, the numbering of cells and rods is given in Fig. 5.10)

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
Experiment KA2001, $p_{en} = 1.039 \times 10^5$ Pa, $T_{en} = 278.7$ K, $G = 0.1008$ kg/s								
1	1	327.4	311.2	0.9205	56.70	11.07	0.631	0.503
1	3	325.1	311.2	0.9239	66.27	12.93	0.631	0.588
24	6	321.9	311.3	0.9244	87.65	17.10	0.612	0.797
24	7	320.2	311.3	0.9244	104.2	20.32	0.612	0.947
24	12	320.2	311.3	0.8511	95.49	18.63	0.612	0.868
25	7	319.8	311.3	0.9244	109.1	21.28	0.608	0.996
25	12	319.5	311.3	0.8511	104.2	20.32	0.608	0.951
25	13	315.1	311.3	0.8511	227.3	44.33	0.608	2.076
49	21	313.6	308.1	0.8699	156.3	23.60	0.398	1.550
49	29	312.4	308.1	0.8759	203.8	30.78	0.398	2.022
55	29	312.5	304.8	0.8759	113.9	15.38	0.342	1.142
Experiment KA2002, $p_{en} = 1.2851 \times 10^5$ Pa, $T_{en} = 276.7$ K, $G = 0.174$ kg/s								
1	1	330.8	314.8	1.844	115.5	22.30	1.062	0.668
1	3	331.1	314.8	1.850	113.6	21.93	1.062	0.657
24	6	326.2	315.0	1.851	164.3	31.72	1.046	0.963
24	7	325.3	315.0	1.851	179.5	34.65	1.046	1.051
24	12	323.5	315.0	1.709	200.0	38.60	1.046	1.171
25	7	324.9	314.9	1.851	186.0	35.92	1.046	1.090
25	12	322.9	314.9	1.709	214.6	41.43	1.046	1.257
25	13	318.8	314.9	1.709	444.3	85.57	1.046	2.596
49	21	316.1	310.8	1.746	329.6	49.36	0.681	2.112
49	29	316.1	310.8	1.746	334.2	50.06	0.681	2.142
55	29	315.5	306.8	1.746	202.2	27.11	0.590	1.300
Experiment KA2003, $p_{en} = 1.5038 \times 10^5$ Pa, $T_{en} = 275.6$ K, $G = 0.2418$ kg/s								
1	1	328.9	313.7	2.539	167.0	32.34	1.470	0.748
1	3	328.8	313.7	2.549	168.4	32.61	1.470	0.754
24	6	323.5	313.7	2.551	262.4	50.81	1.460	1.181
24	7	323.2	313.7	2.551	269.5	52.19	1.460	1.213

Table S.8 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
24	12	321.2	313.7	2.359	316.5	61.29	1.460	1.424
25	7	322.7	313.7	2.551	283.1	54.82	1.452	1.280
25	12	320.5	313.7	2.359	347.2	67.25	1.452	1.570
25	13	316.5	313.7	2.359	847.8	164.2	1.452	3.832
49	21	313.6	309.4	2.406	575.5	86.51	0.952	2.830
49	29	314.1	309.4	2.423	521.9	78.45	0.952	2.566
55	29	313.7	305.3	2.423	290.1	39.08	0.829	1.428
Experiment KA2004, $p_{en} = 2.3795 \cdot 10^5$ Pa, $T_{en} = 298.3$ K, $G = 0.3284$ kg/s								
1	1	361.7	339.6	3.714	167.6	30.28	1.870	0.577
1	3	361.5	339.6	3.729	170.0	30.72	1.870	0.586
24	6	356.4	339.6	3.730	222.8	40.25	1.851	0.774
24	7	355.6	339.6	3.730	232.7	42.05	1.851	0.808
24	12	354.1	339.6	3.504	241.2	43.57	1.851	0.838
25	7	354.5	339.5	3.730	249.0	45.00	1.852	0.865
25	12	353.3	339.5	3.504	255.4	46.15	1.852	0.887
25	13	384.4	339.5	3.504	394.0	71.19	1.852	1.368
49	21	344.8	334.9	3.567	357.5	50.14	1.213	1.352
49	29	346.3	334.9	3.594	314.8	44.15	1.213	1.190
55	29	345.6	330.4	3.594	235.7	29.62	1.056	0.892
Experiment KA2005, $p_{en} = 2.7243 \cdot 10^5$ Pa, $T_{en} = 300.2$ K, $G = 0.5848$ kg/s								
1	1	353.4	333.5	5.240	263.4	48.30	3.335	0.580
1	3	353.7	333.5	5.261	260.8	47.83	3.335	0.574
24	6	349.0	333.5	5.265	338.7	62.13	3.335	0.746
24	7	349.1	333.5	5.265	336.9	61.79	3.335	0.742
24	12	347.6	333.5	4.924	347.5	63.74	3.335	0.765
25	7	348.1	333.4	5.265	358.2	65.71	3.330	0.790
25	12	346.9	333.4	4.924	364.9	66.93	3.330	0.804
25	13	342.8	333.4	4.294	521.4	95.66	3.330	1.150
49	21	339.3	329.2	5.005	498.5	70.91	2.227	1.176
49	29	341.1	329.2	5.004	423.6	60.25	2.227	0.999
55	29	340.1	325.6	5.004	348.1	44.28	1.932	0.823
Experiment KA2006, $p_{en} = 2.1844 \times 10^5$ Pa, $T_{en} = 301.3$ K, $G = 0.7146$ kg/s								
1	1	346.3	330.2	5.325	331.8	61.44	4.041	0.632
1	3	346.7	330.2	5.358	325.9	60.35	4.041	0.621
24	6	343.3	330.2	5.352	409.0	75.73	4.041	0.779

Table S.8 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
24	7	342.8	330.2	5.352	423.0	78.32	4.041	0.806
24	12	341.9	330.2	5.009	427.9	79.23	4.041	0.816
25	7	341.8	330.1	5.352	457.8	84.79	4.043	0.872
25	12	341.0	330.1	5.009	459.8	85.13	4.043	0.876
25	13	337.7	330.1	5.009	656.8	121.6	4.043	1.252
49	21	335.2	326.2	5.095	567.0	81.38	2.735	1.145
49	29	336.6	326.2	5.131	493.9	70.88	2.735	0.997
55	29	335.8	326.2	5.131	402.9	51.65	2.371	0.814
Experiment KA2007, $p_{en} = 2.4568 \cdot 10^5$ Pa, $T_{en} = 305.9$ K, $G = 0.8147$ kg/s								
1	1	343.7	331.5	5.295	433.2	79.93	4.597	0.742
1	3	344.0	331.5	5.321	423.2	78.08	4.597	0.725
24	6	340.9	331.4	5.325	546.2	104.1	4.592	0.968
24	7	340.4	331.4	5.325	594.9	109.8	4.592	1.02
24	12	339.9	331.4	4.991	590.3	108.9	4.592	1.012
25	7	339.4	331.4	5.325	665.6	122.8	4.593	1.141
25	12	339.0	331.4	4.991	654.7	120.8	4.593	1.123
25	13	336.1	331.4	4.991	1065	196.6	4.593	1.826
49	21	333.9	328.0	5.079	864.0	123.4	3.059	1.587
49	29	335.2	328.0	5.115	714.1	102.0	3.059	1.311
55	29	334.5	325.2	5.115	551.7	70.30	2.648	1.015
Experiment KA2008, $p_{en} = 2.7818 \cdot 10^5$ Pa, $T_{en} = 309.1$ K, $G = 0.9439$ kg/s								
1	1	340.4	331.0	5.159	551.6	101.8	5.317	0.842
1	3	340.9	331.0	5.183	523.6	96.68	5.317	0.799
24	6	338.1	331.0	5.185	733.0	135.5	5.318	1.118
24	7	337.6	331.0	5.185	778.8	143.8	5.318	1.188
24	12	337.4	331.0	4.864	763.0	140.9	5.318	1.164
25	7	336.6	331.0	5.184	912.0	168.4	5.313	1.393
25	12	336.8	331.0	4.864	835.8	154.3	5.313	1.276
25	13	334.4	331.0	4.864	1418.0	261.9	5.313	2.166
49	21	332.5	328.0	4.950	1106.0	157.8	3.532	1.809
49	29	333.3	328.0	4.990	941.4	134.4	3.532	1.541
55	29	332.8	325.6	4.990	690.8	87.89	3.057	1.131
Experiment KA2009, $p_{en} = 3.0568 \times 10^5$ Pa, $T_{en} = 308.0$ K, $G = 1.094$ kg/s								
1	1	336.8	327.2	5.094	529.5	98.72	6.160	0.725
1	3	336.8	327.2	5.112	531.4	99.07	6.160	0.728

Table S.8 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
24	6	334.2	327.1	5.114	723.5	134.9	6.153	0.992
24	7	333.9	327.1	5.114	754.0	140.6	6.153	1.034
24	12	333.6	327.1	4.802	741.4	138.2	6.153	1.016
25	7	333.5	327.1	5.114	797.8	148.8	6.147	1.095
25	12	333.2	327.1	4.802	794.4	148.1	6.147	1.090
25	13	330.9	327.1	4.802	1286.4	239.9	6.147	1.765
49	21	329.0	324.5	4.894	1074.0	154.7	4.093	1.576
49	29	329.9	324.5	4.930	901.1	129.8	4.093	1.323
55	29	329.4	322.4	4.930	699.0	89.7	3.536	1.027

Table S.9

Local heat transfer of rods in an 85-rod assembly with $s/d = 1.23$ and wire wrapping with $T/d = 28$ in stabilized flow region in cross section at a distance of 1.259 m from assembly inlet

(Assembly No. 7 in Table 5.2, the numbering of cells and rods is given in Fig. 5.10)

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
Experiment KA1005, $p_{en} = 2.3089 \cdot 10^5$ Pa, $T_{en} = 304.8$ K, $G = 0.5679$ kg/s								
1	1	356.7	337.8	4.851	255.5	46.38	3.209	0.574
1	3	355.4	337.8	4.837	273.9	49.74	3.209	0.616
24	6	357.5	337.5	5.076	254.8	46.28	3.202	0.574
24	7	358.9	337.5	5.076	238.3	43.28	3.202	0.537
24	12	355.6	337.5	4.891	271.6	49.34	3.202	0.612
25	7	358.0	337.4	5.076	246.1	44.73	3.200	0.555
25	12	355.2	337.4	4.891	273.6	49.73	3.200	0.617
25	13	355.9	337.4	4.891	264.0	47.98	3.200	0.595
49	21	352.4	333.2	4.822	251.2	35.40	2.139	0.606
Experiment KA1006, $p_{en} = 2.2308 \cdot 10^5$ Pa, $T_{en} = 309.2$ K, $G = 0.7120$ kg/s								
1	1	354.4	340.8	5.670	416.6	75.09	3.924	0.791
1	3	353.6	340.8	5.631	439.5	79.22	3.924	0.835
24	6	356.0	340.6	5.903	382.3	68.98	3.923	0.727

Table S.9 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
24	7	357.1	340.6	5.903	358.0	64.57	3.923	0.681
24	12	353.7	340.6	5.661	433.0	78.09	3.923	0.823
25	7	355.9	340.4	5.903	380.3	68.62	3.927	0.723
25	12	353.1	340.4	5.661	444.4	80.17	3.927	0.844
25	13	354.1	340.4	5.661	412.0	74.34	3.927	0.783
49	21	351.1	336.1	5.560	369.4	51.68	2.695	0.736
49	29	352.1	336.1	5.726	357.0	49.95	2.695	0.711
55	29	351.9	333.8	5.726	315.9	39.38	2.338	0.628
Experiment KA1007, $p_{en} = 2.4881 \cdot 10^5$ Pa, $T_{en} = 301.9$ K, $G = 0.8204$ kg/s								
1	1	338.5	327.1	5.147	451.9	84.32	4.660	0.774
1	3	338.6	327.1	5.140	446.6	83.35	4.660	0.765
24	6	340.3	327.0	5.331	399.3	74.54	4.658	0.685
24	7	341.4	327.0	5.331	368.2	68.73	4.658	0.631
24	12	338.9	327.0	5.117	426.6	79.65	4.658	0.732
25	7	340.6	326.8	5.331	386.7	72.21	4.656	0.664
25	12	338.8	326.8	5.117	426.3	79.61	4.656	0.732
25	13	339.1	326.8	5.117	415.2	77.54	4.656	0.713
49	21	336.4	323.3	5.059	383.0	55.36	3.186	0.689
49	29	337.4	323.3	5.192	368.1	53.22	3.186	0.663
55	29	337.1	321.5	5.192	332.5	42.80	2.767	0.597
Experiment KA1009, $p_{en} = 3.0073 \cdot 10^5$ Pa, $T_{en} = 310.2$ K, $G = 1.063$ kg/s								
1	1	338.7	330.0	4.979	568.8	105.3	5.960	0.794
1	3	338.6	330.0	4.988	581.0	107.5	5.960	0.811
24	6	340.5	329.9	5.215	489.8	90.69	5.956	0.684
24	7	341.2	329.9	5.215	462.4	85.62	5.956	0.646
24	12	339.1	329.9	5.017	543.3	100.6	5.956	0.759
25	7	340.4	329.8	5.215	489.5	90.66	5.959	0.684
25	12	338.7	329.8	5.017	561.8	104.0	5.959	0.785
25	13	339.5	329.8	5.017	516.3	95.63	5.959	0.721
49	21	337.4	326.9	4.908	469.6	67.21	4.069	0.688
49	29	338.0	326.9	5.073	457.2	65.44	4.069	0.670
55	29	337.9	325.4	5.073	406.4	51.73	4.069	0.593

Table S.10

Local heat transfer of rods in an 85-rod assembly with s/d = 1.23 and wire wrapping with T/d = 69.8 in stabilized flow region in cross section at a distance of 1.259 m from assembly inlet (Assembly No. 7 in Table 5.2, the numbering of cells and rods is given in Fig. 5.10)

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$\mathrm{Nu}_{i,j}$	$\mathrm{Re}_i \times 10^{-4}$	$\mathrm{Nu}_{i,j}/\mathrm{Nu}^0_{i,j}$
Experiment KA3001, p_{en} = 1.0378×10⁵ Pa, T_{en} = 282.9 K, G = 0.1022 kg/s								
1	1	337.4	323.2	1.672	117.3	22.15	0.629	1.010
1	3	337.2	323.2	1.658	118.0	22.28	0.629	1.016
24	6	331.9	323.3	1.665	195.4	36.88	0.607	1.729
24	7	335.6	323.3	1.665	136.3	25.72	0.607	1.206
24	12	335.4	323.3	1.601	133.1	25.13	0.607	1.178
25	7	335.4	323.4	1.665	138.6	26.17	0.601	1.237
25	12	335.5	323.4	1.601	131.5	24.82	0.601	1.175
25	13	337.3	323.4	1.601	114.9	21.68	0.601	1.025
49	21	328.8	319.4	1.607	171.9	25.15	0.388	1.689
49	29	326.2	319.4	1.618	237.8	34.80	0.388	2.337
55	29	326.5	315.1	1.618	142.5	18.69	0.335	1.411
Experiment KA3002, p_{en} = 1.2447×10⁵ Pa, T_{en} = 284.0 K, G = 0.1528 kg/s								
1	1	352.0	323.5	1.672	58.77	11.09	0.917	0.374
1	3	346.8	323.5	1.658	71.18	13.43	0.917	0.453
24	6	339.9	323.7	1.665	103.0	19.41	0.899	0.665
24	7	343.6	323.7	1.665	83.62	15.77	0.899	0.540
24	12	341.7	323.7	1.601	88.98	16.78	0.899	0.575
25	7	343.4	323.7	1.665	84.47	15.93	0.899	0.546
25	12	342.4	323.7	1.601	85.43	16.11	0.899	0.552
25	13	344.0	323.7	1.601	78.88	14.87	0.899	0.510
49	21	336.3	319.6	1.607	96.14	14.06	0.589	0.676
49	29	334.8	319.6	1.618	106.2	15.52	0.589	0.746
55	29	335.2	315.3	1.618	81.43	10.67	0.507	0.578
Experiment KA3003, p_{en} = 1.5041×10⁵ Pa, T_{en} = 280.9 K, G = 0.2314 kg/s								
1	1	337.1	317.5	2.343	119.5	22.89	1.391	0.553
1	3	335.1	317.5	2.327	132.3	25.35	1.391	0.612
24	6	328.9	317.5	2.328	204.9	39.27	1.382	0.954
24	7	331.5	317.5	2.328	166.1	31.82	1.382	0.773

Table S.10 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j\times10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i\times10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
24	12	329.3	317.5	2.202	187.0	35.83	1.382	0.870
25	7	331.3	317.5	2.328	168.8	32.36	1.382	0.786
25	12	330.1	317.5	2.202	175.2	33.57	1.382	0.815
25	13	332.1	317.5	2.202	150.8	28.89	1.382	0.702
49	21	323.6	313.4	2.208	216.3	32.15	0.903	1.097
49	29	323.1	313.4	2.225	228.8	34.02	0.903	1.161
55	29	323.6	309.4	2.225	154.1	20.52	0.782	0.786
Experiment KA3005, $p_{en}=2.4516\times10^5$ Pa, $T_{en}=303.0$ K, $G=0.5489$ kg/s								
1	1	362.1	338.7	5.290	226.3	40.98	3.071	0.526
1	3	360.5	338.7	5.252	241.1	43.66	3.071	0.560
24	6	354.6	338.7	5.259	330.6	59.86	3.059	0.770
24	7	357.4	338.7	5.259	281.7	51.01	3.059	0.656
24	12	355.6	338.7	5.015	297.3	53.85	3.059	0.693
25	7	356.6	338.6	5.259	292.9	53.05	3.060	0.682
25	12	356.8	338.6	5.015	275.6	49.91	3.060	0.642
25	13	358.7	338.6	5.015	250.4	45.35	3.060	0.583
49	21	350.7	334.2	5.032	304.0	42.71	2.057	0.755
49	29	351.3	334.2	5.069	296.2	41.62	2.057	0.735
55	29	353.0	330.1	5.069	222.0	27.91	1.784	0.553
Experiment KA3006, $p_{en}=2.3172\times10^5$ Pa, $T_{en}=303.3$ K, $G=0.7158$ kg/s								
1	1	350.5	331.5	5.276	278.4	51.35	3.976	0.536
1	3	349.5	331.5	5.239	292.4	53.94	3.976	0.563
24	6	344.9	331.5	5.253	392.8	72.46	3.976	0.756
24	7	347.0	331.5	5.253	340.0	62.73	3.976	0.654
24	12	345.6	331.5	5.004	354.6	65.42	3.976	0.682
25	7	346.2	331.5	5.253	356.9	65.85	3.972	0.687
25	12	346.9	331.5	5.004	325.1	59.98	3.972	0.626
25	13	348.4	331.5	5.004	296.2	54.65	3.972	0.570
49	21	342.1	327.8	5.019	350.1	50.03	2.693	0.712
49	29	342.7	327.8	5.059	338.6	48.38	2.693	0.689
55	29	344.4	324.6	5.059	254.8	32.53	2.341	0.518
Experiment KA3007, $p_{en}=2.6322\times10^5$ Pa, $T_{en}=303.3$ K, $G=0.780$ kg/s								
1	1	346.0	330.2	5.322	337.0	62.36	4.295	0.611

Table S.10 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$Nu_{i,j}$	$Re_i \times 10^{-4}$	$\frac{Nu_{i,j}}{Nu^0_{i,j}}$
1	3	345.1	330.2	5.282	354.4	65.59	4.295	0.643
24	6	341.1	330.1	5.295	483.7	89.53	4.295	0.878
24	7	342.8	330.1	5.295	418.6	77.48	4.295	0.759
24	12	341.7	330.1	5.031	435.8	80.65	4.295	0.791
25	7	342.3	330.1	5.295	434.9	80.50	4.290	0.790
25	12	342.9	330.1	5.031	393.1	72.77	4.290	0.714
25	13	344.2	330.1	5.031	356.3	65.94	4.290	0.647
49	21	338.6	326.6	5.051	419.8	60.16	2.883	0.811
49	29	339.3	326.6	5.088	401.1	57.46	2.883	0.775
55	29	340.8	323.6	5.088	295.0	37.74	2.495	0.571
Experiment KA3008, $p_{en} = 3.1254 \times 10^5$ Pa, $T_{en} = 301.4$ K, $G = 1.002$ kg/s								
1	1	340.5	321.7	5.218	278.1	52.59	5.734	0.409
1	3	339.6	321.7	5.179	289.4	54.73	5.734	0.426
24	6	336.5	321.7	5.176	351.4	66.46	5.726	0.518
24	7	337.8	321.7	5.176	322.0	60.89	5.726	0.474
24	12	336.4	321.7	4.903	333.1	62.96	5.726	0.491
25	7	337.3	321.7	5.176	330.9	62.58	5.719	0.488
25	12	337.5	321.7	4.903	310.1	58.64	5.719	0.457
25	13	338.6	321.7	4.903	290.2	54.88	5.719	0.428
49	21	333.9	319.0	4.920	332.1	48.51	3.829	0.521
49	29	334.0	319.0	4.953	330.4	48.27	3.829	0.519
55	29	335.5	316.7	4.953	263.8	34.36	3.308	0.415
Experiment KA3009, $p_{en} = 3.0041 \times 10^5$ Pa, $T_{en} = 307.1$ K, $G = 1.050$ kg/s								
1	1	345.0	327.1	5.202	290.8	54.21	6.008	0.406
1	3	344.3	327.1	5.171	301.4	56.19	6.008	0.421
24	6	341.1	327.1	5.172	369.8	68.96	6.001	0.517
24	7	342.5	327.1	5.172	336.6	62.76	6.001	0.471
24	12	341.5	327.1	4.944	344.4	64.21	6.001	0.482
25	7	341.9	327.1	5.172	349.7	65.20	6.002	0.489
25	12	342.3	327.1	4.944	325.6	60.71	6.002	0.455
25	13	343.6	327.1	4.944	300.4	56.01	6.002	0.420
49	21	339.1	324.4	4.963	338.5	48.76	4.028	0.503
49	29	339.5	324.4	4.996	331.1	47.69	4.028	0.492
55	29	341.1	322.1	4.996	263.3	33.80	3.476	0.393

Table S.11

Local heat transfer of rods in an 85-rod assembly with s/d = 1.23 and oppositely directed wire wrapping in stabilized flow region in cross section at a distance of 1.288 m (unheated part is 0.594 m long) from assembly inlet

(Assembly No. 8 in Table 5.2, the numbering of cells and rods is given in Fig. 5.11)

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j\times10^{-3}$, W/m²	α_{ij}, W/(m²·K)	Nu_{ij}	$\mathrm{Re}_i\times10^{-4}$	$\mathrm{Nu}_{ij}/\mathrm{Nu}^0_{ij}$
Experiment KA5001, p_{en} = 1.0626×10⁵ Pa, T_{en} = 290.8 K, G = 0.1022 kg/s								
1	1	348.0	334.5	2.517	186.2	31.17	0.574	1.529
1	3	349.3	334.5	2.520	171.2	28.65	0.574	1.406
24	6	351.6	334.0	2.530	143.2	22.43	0.533	1.167
24	7	349.4	334.0	2.530	163.9	25.68	0.533	1.336
24	12	340.5	334.0	2.366	364.1	57.02	0.533	2.966
25	7	348.4	333.9	2.530	173.8	29.14	0.572	1.434
25	12	338.7	333.9	2.366	484.8	81.26	0.572	3.998
25	13	348.0	333.9	2.366	167.5	28.07	0.572	1.381
49	21	346.7	330.1	2.368	142.8	15.89	0.369	1.320
49	29	338.1	330.1	2.364	294.6	38.98	0.369	2.724
55	29	336.8	328.5	2.264	282.6	26.20	0.248	2.515
Experiment KA5002, p_{en} = 1.2831×10⁵ Pa, T_{en} = 289.5 K, G = 0.1636 kg/s								
1	1	354.1	328.1	3.552	136.3	23.18	0.927	0.775
1	3	353.6	328.1	3.568	139.7	23.76	0.927	0.795
24	6	352.6	327.8	3.579	144.0	22.92	0.860	0.813
24	7	350.7	327.8	3.579	156.3	24.87	0.860	0.883
24	12	341.4	327.8	3.330	243.8	38.80	0.860	1.377
25	7	351.2	327.7	3.579	151.8	25.85	0.922	0.868
25	12	340.5	327.7	3.330	259.4	44.17	0.922	1.483
25	13	347.8	327.7	3.330	165.1	28.12	0.922	0.944
49	21	347.2	324.3	3.324	145.5	19.55	0.598	0.927
49	29	339.4	324.3	3.313	219.1	29.44	0.598	1.396
55	29	340.5	322.9	3.313	187.8	17.67	0.404	1.147
Experiment KA5003, p_{en} = 1.5044×10⁵ Pa, T_{en} = 289.4 K, G = 0.2309 kg/s								
1	1	342.2	329.2	5.190	401.4	68.05	1.300	1.736

Table S.11 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	α_{ij}, W/(m²·K)	Nu_{ij}	$Re_i \times 10^{-4}$	$\frac{Nu_{ij}}{Nu^0_{ij}}$
1	3	345.7	329.2	5.201	316.3	53.62	1.300	1.368
24	6	348.1	329.0	5.210	273.3	43.34	1.203	1.176
24	7	345.5	329.0	5.210	315.6	50.03	1.203	1.358
24	12	337.3	329.0	4.820	584.0	92.59	1.203	2.512
25	7	345.0	328.9	5.210	323.7	54.92	1.289	1.411
25	12	337.0	328.9	4.820	594.0	100.8	1.289	2.589
25	13	343.3	328.9	4.820	336.3	57.06	1.289	1.466
49	21	343.7	325.5	4.824	264.6	35.42	0.841	1.280
49	29	336.5	325.5	4.822	437.8	58.61	0.841	2.118
55	29	335.5	324.0	4.822	416.6	39.06	0.570	1.927
Experiment KA5004, $p_{en} = 2.2825 \times 10^5$ Pa, $T_{en} = 312.7$ K, $G = 0.3243$ kg/s								
1	1	380.1	348.7	6.526	207.8	33.51	1.763	0.670
1	3	377.2	348.7	6.548	230.1	37.11	1.763	0.742
24	6	378.0	348.6	6.546	222.1	33.49	1.632	0.712
24	7	376.5	348.6	6.546	234.3	35.34	1.632	0.751
24	12	354.1	348.6	6.134	1115.0	168.2	1.632	3.577
25	7	376.5	348.5	6.546	233.5	37.68	1.747	0.759
25	12	353.3	348.5	6.134	1267.5	204.6	1.747	4.119
25	13	372.1	348.5	6.134	259.2	41.84	1.747	0.842
49	21	374.7	345.3	6.139	208.9	26.56	1.143	0.751
49	29	366.0	345.3	6.132	2970.	37.76	1.143	1.067
55	29	366.1	344.0	6.132	277.7	24.71	0.777	0.951
Experiment KA5005, $p_{en} = 2.5911 \times 10^5$ Pa, $T_{en} = 305.8$ K, $G = 0.5628$ kg/s								
1	1	354.9	327.2	6.502	234.3	39.88	3.146	0.502
1	3	350.8	327.2	6.542	277.0	47.16	3.146	0.593
24	6	351.5	327.1	6.542	268.7	42.76	2.901	0.574
24	7	352.2	327.1	6.542	260.8	41.49	2.901	0.557
24	12	336.2	327.1	6.150	681.2	108.4	2.901	1.454
25	7	352.9	327.1	6.542	253.5	43.15	3.101	0.549
25	12	335.3	327.1	6.150	747.0	127.2	3.101	1.618
25	13	348.3	327.1	6.150	289.9	49.35	3.101	0.628
49	21	349.7	325.3	6.151	251.5	33.64	2.033	0.600
49	29	344.0	325.3	6.134	327.4	43.79	2.033	0.781
55	29	343.5	324.6	6.134	324.2	30.30	1.387	0.734

Table S.11 *Continued*

Cell i	Rod j	T_{wj}, K	T_{fi}, K	$q_j \times 10^{-3}$, W/m²	$\alpha_{i,j}$, W/(m²·K)	$\mathrm{Nu}_{i,j}$	$\mathrm{Re}_i \times 10^{-4}$	$\frac{\mathrm{Nu}_{i,j}}{\mathrm{Nu}^0_{i,j}}$
Experiment KA5007, $p_{en} = 2.7501 \times 10^5$ Pa, $T_{en} = 314.8$ K, $G = 0.8174$ kg/s								
1	1	348.0	331.8	7.005	433.2	72.88	4.063	0.747
1	3	344.5	331.8	7.042	554.2	93.24	4.063	0.956
24	6	348.1	331.8	7.038	432.7	68.03	3.745	0.744
24	7	347.1	331.8	7.038	459.6	72.27	3.745	0.791
25	7	347.1	331.8	7.038	460.8	77.52	4.000	0.805
25	13	344.2	331.8	6.580	530.1	89.18	4.000	0.925
49	21	346.5	330.5	6.594	409.8	54.09	2.637	0.783
49	29	342.7	330.5	6.580	536.8	70.86	2.637	1.026
55	29	342.8	330.0	6.580	513.0	47.29	1.803	0.928
Experiment KA5008, $p_{en} = 3.3666 \times 10^5$ Pa, $T_{en} = 316.7$ K, $G = 1.039$ kg/s								
1	1	344.7	330.4	6.816	476.0	80.33	5.130	0.686
1	3	343.9	330.4	6.866	510.0	86.06	5.130	0.732
24	6	345.2	330.4	6.869	465.9	73.48	4.724	0.668
24	7	343.8	330.4	6.869	513.5	80.98	4.724	0.736
25	7	342.7	330.4	6.869	561.4	94.73	5.045	0.817
25	13	340.4	330.4	6.479	650.0	109.7	5.045	0.945
49	21	343.7	329.4	6.488	454.9	60.18	3.334	0.723
49	29	337.5	329.4	6.473	796.3	105.3	3.334	1.265
55	29	335.4	329.1	6.473	1015.0	93.75	2.284	1.523