Datashare 109

Thermal properties of sedimentary rocks in the Tarim Basin, northwestern China

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AAPG Bulletin, v. 103, no. 7 (July 2019), pp. 1605–1624

Table S1. Measured thermal properties of sedimentary rocks in the Tarim Basin

Number	Lithotype	Stratum	Depth, m	Depth, ft	U, ppm (μg/g)	Th, ppm	K, %	ρ, g/cm^3	λ, W/mK	A, μW/m^3	c_p, kJ/(kg·°C)						Porosity, %	Fluid, Water/Oil
											40°C	50°C	60°C	70°C	80°C	90°C		
1	Dolomite	$\in_3$	3182.4	10,441	1.45	1.16	0.12	2.81	4.09	0.48	0.91	0.93	0.94	0.94	0.94	0.95	1.6	–
2	Dolomite	$\in_3$	3178	10,427	2.24	0.43	0.05	2.82	4.29	0.64	0.90	0.92	0.92	0.93	0.93	0.94	1.2	–
3	Limestone	O	2300	7546	0.73	0.77	0.18	2.79	2.55	0.27	0.90	1.02	1.06	1.06	1.03	1.00	3.2	–
4	Mudstone	S	1687.5	5536	2.95	15.20	3.16	2.64	2.98	2.06	0.86	0.96	1.02	1.06	1.07	1.07	3.8	–
5	Sandstone	S	1694.3	5559	2.17	9.75	2.24	2.65	2.68	1.41	0.84	0.92	0.96	0.97	0.97	0.95	2.7	–
6	Sandstone	S_1t	2800	9186	0.75	6.60	0.56	2.54	3.76	0.66	0.83	0.89	0.90	0.92	0.93	0.93	10.0	–
7	Sandstone	S_1t	2402.1	7881	2.11	8.21	2.75	2.53	2.29	1.28	0.92	1.04	1.16	1.25	1.30	1.31	8.3	–
8	Sandstone	S_1t	2593	8507	1.29	5.25	1.11	2.45	2.27	0.73	0.82	0.90	0.92	0.93	0.96	0.95	8.3	–
9	Mudstone	S_1t	2798	9180	1.40	6.85	2.18	2.68	3.24	1.03	0.86	0.95	0.99	1.01	1.02	1.01	7.3	–
10	Conglomerate	S_1t	2401.7	7880	4.75	3.22	1.25	2.58	2.70	1.49	0.83	0.92	0.95	0.96	0.99	1.01	8.3	–
11	Mudstone	$O_{2+3}q$	4368	14,331	3.26	15.90	3.69	2.69	2.05	2.28	0.88	1.00	1.06	1.10	1.10	1.05	2.6	–
12	Mudstone	$O_{2+3}q$	4367.4	14,329	2.70	12.10	2.66	2.69	2.77	1.77	0.91	1.00	1.04	1.08	1.09	1.08	2.6	–
13	Sandstone	D_3d	5440	17,848	0.52	2.45	1.07	2.33	1.48	0.35	0.82	0.90	0.94	0.96	1.00	1.01	3.7	–
14	Mudstone	D_3d	5452	17,887	3.93	15.30	4.09	2.69	2.55	2.45	0.92	1.04	1.12	1.20	1.25	1.25	9.4	√
15	Sandstone	E	2880	9449	2.42	8.29	2.29	2.80	1.68	1.46	0.90	1.01	1.09	1.15	1.19	1.22	17.9	√
16	Mudstone	E	2871	9419	2.21	6.61	2.02	2.56	1.90	1.15	0.86	0.99	1.04	1.07	1.11	1.12	13.2	√
17	Mudstone	T	4420.5	14,503	3.35	12.20	3.22	2.54	1.52	1.89	0.81	0.94	0.98	0.98	0.98	0.97	\	–
18	Sandstone	C	5485	17,995	0.59	2.85	2.19	2.22	1.67	0.46	0.91	1.09	1.21	1.36	1.44	1.40	9.6	√
19	Sandstone	S	6127	20,102	3.59	16.10	4.95	2.71	1.93	2.51	0.93	1.13	1.27	1.42	1.49	1.43	3.5	–
20	Mudstone	S	6084	19,961	2.75	13.80	4.46	2.71	2.57	2.08	0.88	1.02	1.11	1.18	1.20	1.21	\	–
21	Sandstone	O	6495	21,309	2.47	13.00	3.16	2.66	3.83	1.80	0.82	0.96	1.02	1.05	1.06	1.05	2.6	–
22	Sandstone	C_1b	3415	11,204	5.31	18.00	6.41	2.62	2.20	3.12	0.91	1.04	1.14	1.26	1.14	1.47	3.2	–
23	Mudstone	C_1b	3414	11,201	4.23	17.70	6.10	2.69	1.40	2.87	0.88	0.98	1.07	1.17	1.31	1.38	4.2	–
24	Mudstone	C_1b	3417.6	11,213	3.93	14.30	5.25	2.62	1.85	2.42	0.84	0.96	1.01	1.07	1.12	1.11	3.9	–
25	Dolomite	$\in_3ql$	5815	19,078	0.91	0.42	0.07	2.82	3.64	0.28	0.88	0.93	0.92	0.91	0.93	0.94	1.8	–
26	Limestone	O_3l	5158.6	16,925	0.28	0.22	0.04	2.75	2.48	0.09	0.93	0.97	0.98	0.98	0.99	1.00	2.5	–
27	Limestone	O_3l	4911	16,112	0.13	0.39	0.11	2.71	2.23	0.07	0.82	0.87	0.85	0.84	0.86	0.88	4.3	×
28	Dolomite	O_3s	4894.4	16,058	2.12	9.93	2.81	2.69	2.88	1.49	0.85	0.91	0.93	0.94	0.94	0.94	1.1	–
29	Limestone	O_1	4515.3	14,814	0.94	2.73	0.89	2.71	2.14	0.52	0.84	0.90	0.89	0.88	0.89	0.90	\	–
30	Dolomite	O_1	3613	11,854	0.93	0.17	0.07	2.80	4.46	0.27	0.85	0.94	0.94	0.93	0.93	0.92	1.7	–
31	Mudstone	C_1b	3421.6	11,226	4.07	14.00	5.64	2.65	2.15	2.49	0.86	0.99	1.06	1.12	1.17	1.15	2.9	–
32	Dolomite	O_2	5579	18,304	0.62	0.29	0.06	2.70	2.32	0.19	0.85	0.89	0.88	0.86	0.87	0.89	4.5	–
33	Limestone	O_2	5221	17,129	0.40	1.40	0.38	2.53	2.71	0.22	0.81	0.86	0.84	0.83	0.84	0.85	4.5	–
34	Limestone	C	4256.5	13,965	0.81	3.71	1.37	2.61	2.06	0.57	0.86	0.94	0.95	0.97	1.00	1.01	\	–
35	Sandstone	D	4351.8	14,278	0.71	4.37	0.80	2.60	2.77	0.54	0.75	0.79	0.78	0.77	0.79	0.82	\	–
36	Sandstone	S	4701.2	15,424	2.87	4.58	1.36	2.67	2.56	1.17	0.80	0.84	0.84	0.83	0.85	0.87	8.9	√
37	Sandstone	S	4922.7	16,151	1.07	6.63	1.87	2.51	2.81	0.84	0.82	0.89	0.90	0.91	0.92	0.91	4.0	√
38	Mudstone	S	5004.5	16,419	3.35	13.90	4.81	2.71	1.40	2.28	0.87	0.98	1.05	1.12	1.19	1.22	8.7	–
39	Sandstone	S	5009.1	16,434	0.63	2.30	0.29	2.75	3.40	0.35	0.76	0.79	0.78	0.76	0.77	0.78	4.3	×
40	Limestone	S	5337	17,510	0.53	1.37	0.36	2.71	2.28	0.26	0.83	0.88	0.87	0.86	0.89	0.90	7.0	–
41	Limestone	C_1b	3302.5	10,835	2.44	2.56	1.67	2.87	2.06	1.02	0.82	0.90	0.92	0.94	0.98	0.98	5.2	–
42	Dolomite	$\in$	6438	21,122	0.63	2.63	1.17	2.73	4.05	0.46	0.92	1.02	1.03	1.05	1.08	1.10	0.9	–
43	Sandstone	T_3h	5248.5	17,220	1.47	7.45	2.33	2.31	1.19	0.95	0.82	0.86	0.86	0.85	0.86	0.86	12.5	√
44	Sandstone	T_3h	5250.5	17,226	1.50	5.94	2.73	2.51	1.27	0.98	0.81	0.87	0.86	0.86	0.88	0.89	15.0	√
45	Sandstone	K_1kp	4982	16,345	1.20	5.78	2.18	2.48	2.31	0.84	0.83	0.91	0.93	0.94	0.98	0.99	1.1	√
46	Limestone	$O_{1-2}y$	5716.2	18,754	0.52	0.24	0.03	2.69	2.16	0.15	0.82	0.86	0.84	0.82	0.85	0.87	5.0	√
47	Sandstone	$O_{1-2}y$	5818.6	19,090	1.08	6.26	1.64	2.47	1.73	0.79	0.83	0.91	0.94	0.97	1.02	1.01	\	×
48	Limestone	$O_{1-2}y$	6109	20,043	0.99	0.42	0.18	2.72	1.94	0.30	0.84	0.88	0.87	0.85	0.87	0.89	2.2	√
49	Sandstone	$O_{1-2}y$	5820	19,095	1.01	6.76	1.20	2.40	1.90	0.75	0.85	0.93	0.96	0.98	1.02	1.03	2.2	×
50	Limestone	$O_{1-2}y$	5727.7	18,792	0.40	0.27	0.04	2.79	2.04	0.13	0.82	0.85	0.84	0.82	0.84	0.86	5.0	√
51	Limestone	S	1692.6	5553	2.23	10.30	2.78	2.60	2.46	1.49	0.83	0.91	0.93	0.94	0.96	0.95	2.8	–
52	Sandstone	S_1t	5354.2	17,566	0.45	2.82	0.69	2.52	1.51	0.35	0.90	0.95	0.98	0.99	0.99	1.00	9.0	√
53	Sandstone	D_3d	5283	17,333	1.21	7.94	2.47	2.65	2.24	1.07	1.02	1.11	1.16	1.22	1.25	1.26	10.0	√
54	Sandstone	C_1b	5206.5	17,082	1.41	20.20	3.08	2.72	2.74	2.07	0.99	1.11	1.19	1.25	1.26	1.26	6.8	√

(*continued*)

Table S1. Continued

Number	Lithotype	Stratum	Depth, m	Depth, ft	U, ppm (μg/g)	Th, ppm	K, %	ρ, g/cm^3	λ, W/mK	A, μW/m^3	c_p, kJ/(kg·°C)						Porosity, %	Fluid, Water/Oil
											40°C	50°C	60°C	70°C	80°C	90°C		
55	Sandstone	S_1t	5353	17,562	0.65	3.98	0.81	2.55	2.32	0.49	0.96	1.18	1.27	1.26	1.20	1.14	9.0	√
56	Mudstone	S_1k	5889	19,321	2.73	14.20	4.42	2.68	2.10	2.08	0.88	0.99	1.05	1.11	1.18	1.23	5.0	–
57	Mudstone	S_1k	5927	19,446	2.80	14.40	4.05	2.82	1.93	2.19	0.87	0.97	1.03	1.08	1.14	1.16	2.5	–
58	Limestone	O_2yj	6885.5	22,590	0.72	0.32	0.05	2.62	1.89	0.21	0.84	0.88	0.88	0.88	0.88	0.88	3.7	×
59	Sandstone	J_1y	4068	13,347	2.90	20.10	3.51	2.62	1.54	2.39	0.96	1.05	1.12	1.19	1.31	1.40	\	–
60	Mudstone	T_2a	4358	14,298	2.83	10.40	2.85	2.54	1.72	1.61	0.96	1.03	1.09	1.18	1.32	1.43	\	–
61	Mudstone	J_1y	4068.5	13,348	3.03	22.30	3.52	2.44	1.69	2.40	0.98	1.06	1.12	1.20	1.33	1.44	\	–
62	Sandstone	J_1y	4073.6	13,365	0.88	6.66	3.23	2.33	1.21	0.85	0.86	0.92	0.94	0.94	0.96	0.99	\	–
63	Sandstone	T_2a	4358	14,298	3.11	11.50	3.06	2.51	1.64	1.75	0.98	1.05	1.11	1.21	1.35	1.47	\	–
64	Sandstone	J_1y	4070.6	13,355	3.53	17.80	3.21	2.54	2.45	2.29	0.93	1.03	1.08	1.16	1.26	1.33	\	–
65	Sandstone	C_1b	5204.9	17,076	2.08	12.40	3.80	2.70	2.55	1.75	1.03	1.17	1.29	1.41	1.47	1.50	6.8	√
66	Mudstone	C_1b	5206.3	17,081	2.43	19.30	3.20	2.75	2.50	2.30	0.97	1.07	1.12	1.17	1.26	1.33	6.8	–
67	Sandstone	S_1t	5351.7	17,558	0.66	4.33	0.91	2.47	2.05	0.51	0.95	1.04	1.09	1.12	1.13	1.13	9.0	√
68	Sandstone	S_1t	5356.4	17,574	0.96	6.15	1.28	2.38	2.13	0.70	0.80	0.85	0.88	0.90	0.92	0.92	7.8	√
69	Mudstone	S_1k	5890.8	19,327	5.12	11.90	3.74	2.67	2.03	2.46	0.86	0.94	1.00	1.05	1.13	1.16	5.0	–
70	Mudstone	S_1k	5920.5	19,424	2.54	13.00	4.18	2.67	2.14	1.92	0.85	0.95	0.99	1.04	1.11	1.13	10.0	–
71	Mudstone	S_1k	5927	19,446	2.93	14.10	4.26	2.67	2.13	2.11	0.87	0.94	1.00	1.05	1.12	1.13	5.0	–
72	Sandstone	S_1k	5917.2	19,413	2.41	13.10	2.59	2.55	2.47	1.67	0.81	0.88	0.92	0.95	1.01	1.04	5.0	–
73	Mudstone	S_1k	5921.1	19,426	2.88	14.50	4.50	2.69	2.10	2.16	0.90	0.97	1.03	1.08	1.16	1.21	10.0	–
74	Sandstone	P_1	1759.8	5774	4.98	8.55	1.44	2.38	1.52	1.77	0.95	1.08	1.18	1.23	1.25	1.22	5.0	–
75	Sandstone	P_1	1748.2	5736	2.36	8.97	1.70	2.53	1.43	1.30	0.82	0.90	0.94	0.97	1.00	0.99	8.3	–
76	Mudstone	P_2s	4200.5	13,781	4.31	17.70	3.11	2.44	2.33	2.37	1.02	1.06	1.12	1.22	1.35	1.48	\	–
77	Mudstone	K_1s	5188.7	17,023	3.43	10.10	2.44	2.63	1.85	1.76	0.86	0.91	0.93	0.97	1.05	1.10	\	–
78	Sandstone	$E_{1\text{-}2}km$	6792.5	22,285	2.45	8.85	2.88	2.67	1.90	1.49	0.82	0.87	0.90	0.92	0.96	0.97	\	–
79	Mudstone	E_3s	6555.2	21,507	2.88	11.50	3.39	2.75	1.86	1.89	0.94	1.06	1.14	1.17	1.17	1.15	\	–
80	Mudstone	J	4410.7	14,471	5.28	19.20	2.60	2.54	2.10	2.75	1.10	1.22	1.33	1.47	1.59	1.63	\	–
81	Mudstone	N_1k	2979	9774	3.44	15.10	4.44	2.48	1.44	2.16	1.06	1.16	1.28	1.41	1.50	1.58	\	–
82	Mudstone	J	4412.1	14,475	5.69	24.10	3.07	2.56	1.94	3.24	0.98	1.09	1.19	1.33	1.50	1.59	\	–
83	Sandstone	J	4414.3	14,483	0.71	2.59	2.32	2.41	1.92	0.52	0.78	0.82	0.82	0.82	0.85	0.87	\	–
84	Mudstone	K_1kp	4042.9	13,264	3.03	17.50	4.00	2.56	1.42	2.24	0.90	0.96	1.00	1.07	1.19	1.28	\	–
85	Mudstone	N_1k	3277.5	10,753	3.55	11.20	3.58	2.50	1.08	1.87	1.00	1.06	1.13	1.25	1.36	1.45	\	–
86	Mudstone	K_1kp	4155.2	13,633	2.51	13.80	3.28	2.68	1.94	1.90	0.87	0.93	0.98	1.06	1.17	1.24	\	–
87	Conglomerate	Z_2s	/	/	0.58	1.55	0.33	2.56	5.00	0.27	0.75	0.78	0.77	0.76	0.78	0.79	2.2	–
88	Dolomite	$\in_1y$	/	/	0.59	0.07	0.01	2.85	4.45	0.17	0.87	0.90	0.88	0.87	0.88	0.89	1.4	–
89	Limestone	P_1k	/	/	3.11	4.76	0.14	2.67	3.78	1.13	0.86	0.89	0.89	0.88	0.89	0.90	2.2	–
90	Mudstone	O_3y	/	/	2.92	6.37	1.67	2.56	3.54	1.28	0.85	0.92	0.97	1.00	1.01	1.00	2.3	–
91	Sandstone	O_3y	/	/	3.34	15.60	3.79	2.68	3.45	2.28	0.96	1.07	1.18	1.25	1.26	1.19	4.0	–
92	Sandstone	O_3y	/	/	1.13	5.72	1.37	2.73	4.15	0.82	0.82	0.88	0.90	0.91	0.90	0.89	2.6	–
93	Limestone	O_3ql	/	/	0.37	2.49	0.32	2.71	3.61	0.30	0.86	0.89	0.89	0.90	0.90	0.90	2.5	–
94	Sandstone	T_2a	/	/	2.37	8.45	2.83	2.32	1.30	1.26	0.96	1.05	1.13	1.23	1.33	1.42	\	–
95	Salt	E	/	/	0.16	0.43	0.07	2.12	3.41	0.06	0.76	0.81	0.81	0.82	0.84	0.86	3.8	–
96	Salt	E	/	/	0.66	1.56	0.09	2.17	3.83	0.23	0.82	0.85	0.85	0.85	0.86	0.87	1.8	–
97	Salt	E	/	/	0.34	0.84	0.13	2.17	4.26	0.13	0.85	0.87	0.86	0.86	0.87	0.87	1.3	–
98	Salt	E	/	/	0.09	0.13	0.03	2.17	5.09	0.03	0.77	0.79	0.79	0.80	0.82	0.84	1.0	–
99	Salt	E	/	/	0.19	0.19	0.03	2.17	5.15	0.05	0.79	0.82	0.83	0.83	0.85	0.86	0.8	–
100	Salt	E	/	/	0.38	0.91	0.18	2.18	4.49	0.14	0.77	0.82	0.81	0.81	0.83	0.86	1.9	–
101	Salt	E	/	/	0.25	0.62	0.12	2.19	5.35	0.10	0.82	0.84	0.82	0.82	0.82	0.83	0.4	–

Abbreviations: / = outcrop samples without depth; \ = no porosity data; √ = water; × = oil; – = without water or oil; λ = thermal conductivity; ρ = density; $\in$ = Cambrian, $\in_1y$ = lower Cambrian, $\in_3/\in_3ql$ = upper Cambrian; A = radiogenic heat production of rock; C = Carboniferous, C_1b = Lower Carboniferous; c_p = specific heat capacity; D = Devonian, D_3d = Upper Devonian; E = Paleogene, $E_{1\text{-}2}km$ = Paleocene and Eocene, E_3s = Oligocene; J = Jurassic, J_1y = Lower Jurassic; K = Cretaceous, K_1kp/K_1s = Lower Cretaceous; N_1k = Miocene; O = Ordovician, O_1= Lower Ordovician, O_2/O_2yj = Middle Ordovician, $O_3l/O_3s/O_3y/O_3ql$= Upper Ordovician, $O_{1\text{-}2}y$ = Lower and Middle Ordovician, $O_{2+3}q$ = Middle and Upper Ordovician; P_1/ P_1k = lower Permian, P_2s = middle Permian; S = Silurian, S_1t/S_1k = lower Silurian; T = Triassic, T_2a = Middle Triassic, T_3h = Upper Triassic; Z_2s = upper Sinian.