

Thermal conductivity of cubic and hexagonal mesoporous silica thin films

Thomas Coquil, Neal J. Hutchinson, Laurent Pilon, Erik K. Richman, Sarah H. Tolbert. "Thermal conductivity of cubic and hexagonal mesoporous silica thin films".

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Measurement method: 3ω method

Temperature: room temperature

Matrix phase: SiO₂ (amorphous)

Validation: Si wafer and dense SiO₂ thin films at room temperature (thermal conductivity averaged over eight repeated experiments)

Sample No.	Structure	Surfactant	Porosity f_v		Film Thickness	Pore Diameter d (nm)		Wall Thickness t_{wall} (nm)		Thermal Conductivity	
			%	Uncertainty	t_f (nm)	Min	Max	Min	Max	k_f (W/m.K)	Uncertainty
1	Hexagonal	P123	46	± 5	320	7	10	3	5	0.18	± 0.02
2	Hexagonal	P123	48	± 5	160	7	10	3	5	0.18	± 0.01
3	Hexagonal	P123	40	± 5	300	7	10	3	5	0.22	± 0.01
4	Hexagonal	P123	43	± 5	540	7	10	3	5	0.20	± 0.01
5	Hexagonal	P123	45	± 5	130	7	10	3	5	0.18	± 0.01
6	Cubic	Brij76	21	± 5	155	3	5	2	3	0.30	± 0.04
7	Cubic	Brij76	23	± 5	150	3	5	2	3	0.29	± 0.02
8	Cubic	Brij76	23	± 5	170	3	5	2	3	0.34	± 0.03
9	Cubic	P123	29	± 5	185	8	10	3	5	0.28	± 0.03
10	Cubic	P123	23	± 5	200	8	10	3	5	0.38	± 0.02
11	Cubic	P123	26	± 5	85	8	10	3	5	0.27	± 0.01
12	Cubic	P123	25	± 5	80	8	10	3	5	0.27	± 0.01
13	Cubic	KLE	27	± 5	300	15	18	10	12	0.35	± 0.01
14	Cubic	KLE	30	± 5	130	15	18	10	12	0.32	± 0.04