

Thermal Conductivity of Ordered Mesoporous Titania Films Made from Nanocrystalline Building Blocks and Sol-Gel Reagents

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Publisher's link: <http://pubs.acs.org/doi/abs/10.1021/jp103251t>

Measurement method: 3 ω method

Temperature: room temperature

Matrix phase: TiO₂ (polycrystalline & amorphous)

Validation: Nontemplated amorphous and crystalline TiO₂ films at room temperature (thermal conductivity averaged over eight repeated experiments)

Sample No.	Crystallinity	Process	Surfactant	Porosity f_v		Film Thickness t_f (nm)	Pore Diameter d (nm)		Wall Thickness t_{wall} (nm)		Crystal Size (nm)		Thermal Conductivity	
				(%)	Uncertainty		Min	Max	Min	Max	Min	Max	k_f (W/m K)	Uncertainty
1	amorphous	sol - gel	-	0	± 2	110	-	-	-	-	-	-	0.59	± 0.02
2	amorphous	sol - gel	-	0	± 2	120	-	-	-	-	-	-	0.87	± 0.04
3	polycrystalline	sol - gel	-	0	± 2	95	-	-	-	-	30	30	1.29	± 0.03
4	polycrystalline	sol - gel	-	0	± 2	150	-	-	-	-	30	30	2.54	± 0.32
5	amorphous	sol - gel	P123	30	± 2	145	7	12	3	6	-	-	0.34	± 0.05
6	amorphous	sol - gel	P123	30	± 2	90	7	12	3	6	-	-	0.38	± 0.01
7	amorphous	sol - gel	KLE	30	± 2	155	14	19	8	12	-	-	0.39	± 0.01
8	amorphous	sol - gel	KLE	30	± 2	150	14	19	8	12	-	-	0.38	± 0.02
9	amorphous	sol - gel	KLE	30	± 2	300	14	19	8	12	-	-	0.48	± 0.02
10	amorphous	sol - gel	KLE	30	± 2	260	14	19	8	12	-	-	0.29	± 0.02
11	amorphous	sol - gel	KLE	30	± 2	250	14	19	8	12	-	-	0.39	± 0.03
12	amorphous	sol - gel	KLE	30	± 2	240	14	19	8	12	-	-	0.32	± 0.00
13	amorphous	sol - gel	KLE	30	± 2	240	14	19	8	12	-	-	0.38	± 0.00
14	polycrystalline	sol - gel	P123	13	± 2	60	7	30	10	50	9	9	1.21	± 0.02
15	polycrystalline	sol - gel	P123	13	± 2	90	7	30	10	50	9	9	1.26	± 0.02
16	polycrystalline	sol - gel	KLE	30	± 2	280	14	19	8	12	12	13	1.05	± 0.06
17	polycrystalline	sol - gel	KLE	30	± 2	260	14	19	8	12	12	13	1.02	± 0.10
18	polycrystalline	sol - gel	KLE	30	± 2	250	14	19	8	12	12	13	1.11	± 0.01
19	polycrystalline	sol - gel	KLE	30	± 2	370	14	19	8	12	12	13	1.05	± 0.01
20	polycrystalline	NC-based	KLE	35	± 2	95	17	25	15	25	9	9	0.44	± 0.02
21	polycrystalline	NC-based	KLE	35	± 2	160	17	25	15	25	9	9	0.53	± 0.00
22	polycrystalline	NC-based	KLE	35	± 2	180	17	25	15	25	9	9	0.46	± 0.00

green means: Nanocrystal-based