INSULATION PROPERTIES OF AEROGELS

Thermal insulation is expressed here in terms of heat loss coefficient (K), and thermal conductivity (λ) at ambient conditions. Lower values for K & λ mean higher insulation. As can be seen, to get the same insulation level, traditional foam insulation layer needs to up to five (5) times thicker (50 mm) than that for an aerogel (10 mm). In addition, acrylic foam could burn and generate toxic and hazardous fumes in case of fire. TAASI's (inorganic) aerogels do not burn or produce hazardous fumes. TAASI Corporation provides various types of aerogel products having different apparent densities, and insulation properties.

TABLE-1: PUBLISHED EXAMPLES

AEROGEL TYPE	**APPARENT DENSITY, ρ** **Kg/m^3** **g/cc**	**HEAT LOSS COEFFICIENT, K; (W/m^{2}K)**	**INSULATION THICKNESS, d, mm**	**THERMAL CONDUCTIVITY λ; (10^{-3} W/ m K)**	**REMARKS & REFERENCES**
Reference: Acrylic Foam (PMMA)		1.8	50 (2-layers)	(90)	A. Geotzberger & W. Wittwer 1985
SiO_2 Aerogel : (a) Air- filled (b) vacuum	232 0.232 232 0.232	2.0 1.1	10 10	13, (20) (11)	ibid.
SiO_2	270 0.27 200 0.20 105 0.105 109 0.109 80 0.080 75 0.075	1.5 0.6 1.5	11 15 22 9	13 (16.5) (13.2) 13 16.3 (13.5)	λ = 10 - 20 for ρ = 0.1 - 0.2 Kistler, '34-'42, Buttner et al, '85, Fricke et al, '85, Nilsson et al, '85
SiO_2 - C	70-90 0.07-0.09			14.6	D. Lee et al, '95
SiO_2 - TiO_2	260 0.26 200 0.20			25 12 (at ambient T) 38 (at 800 K)	J. Kuhn et al, '95, J. Wang et al, '95
SiO_2-TiO_2-FeO	200 0.20				

TABLE-2: PREDICTION OF SILICA AEROGEL'S THERMAL CONDUCTIVITY FROM ITS APPARENT DENSITY, BASED ON A CORROLATION BY NILSSON ET AL.* (1985).

APPARENT DENSITY; ρ		**THERMAL CONDUCTIVITY; λ = K . d**
Kg / m^3	**g / cc**	**10^{-3}W/ m K**
109	0.109	13
140	0.14	19
200	0.20	24
300	0.30	36
400	0.40	48
500	0.50	60
600	0.60	72

*Disclaimer: TAASI Corporation does not guarantee the accuracy of these predictions. These data should be taken as rough estimates only. TAASI recommends that each aerogel sample be tested by Client.