

본 사이트에서 수업 자료로 이용되는 저작물은 **저작권법 제25조 수업목적저작물 이용 보상금제도**에 의거, **한국복제전송저작권협회와 약정을 체결하고** 적법하게 이용하고 있습니다. 약정범위를 초과하는 사용은 저작권법에 저촉될 수 있으므로 **수업자료의 대중 공개·공유 및 수업 목적 외의 사용을 금지합니다.**

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열전달

1. 열전달 (heat transfer)
2. 전도 (conduction)
3. 대류 (convection)
4. 복사 (radiation)
5. 냉각방법 (cooling method)

1. 열전달 (heat transfer) 이란 ?

※ Thermodynamics :

2. 전도 (conduction)

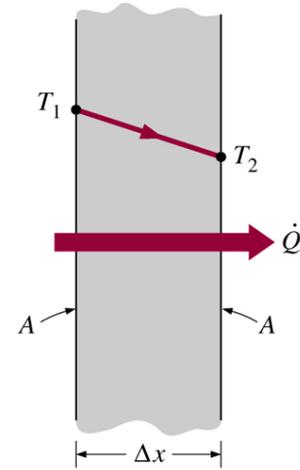
$$\dot{Q}_{cond} = kA \frac{\Delta T}{\Delta x} [W]$$

\dot{Q}_{cond}

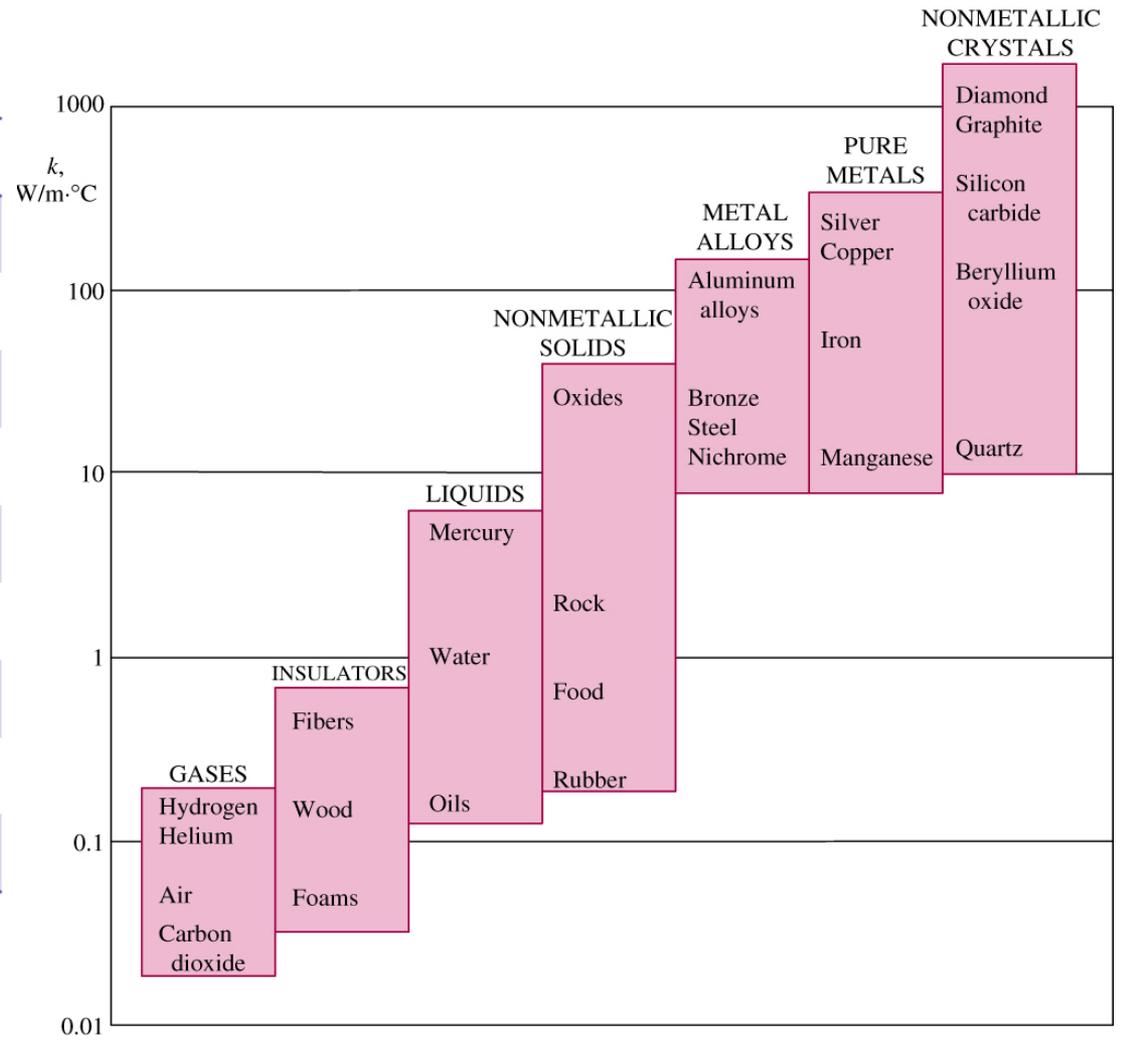
k

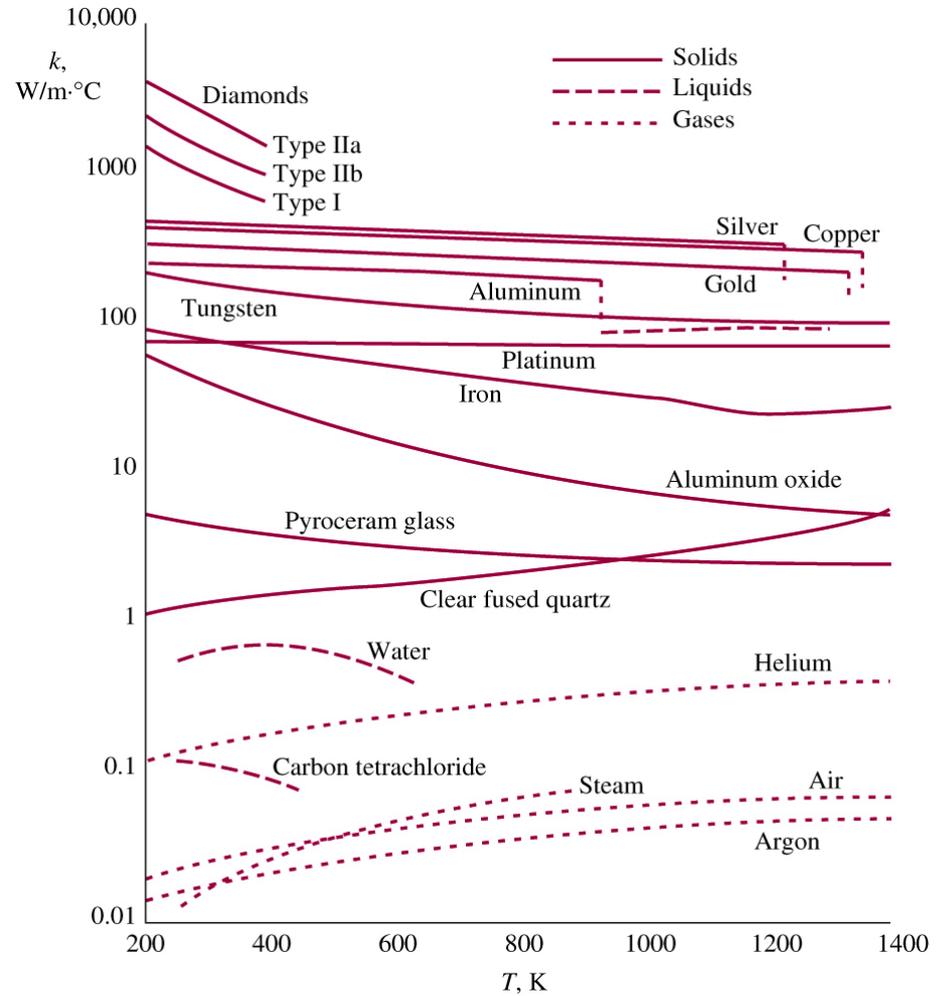
ΔT

Δx



material	k, [w/m·°C]
Copper	385
Aluminum	205
Electrical steel	20-46
Brass	100
Mica	0.36
Varnished cloth	0.07
Air	0.025
Class A insulation	0.12
Class B insulation	0.0015-0.2





Temperature dependence of thermal conductivity

3. 대류 (convection)

$$\dot{Q}_{conv} = hA_s (T_s - T_a) [W]$$

\dot{Q}_{conv}

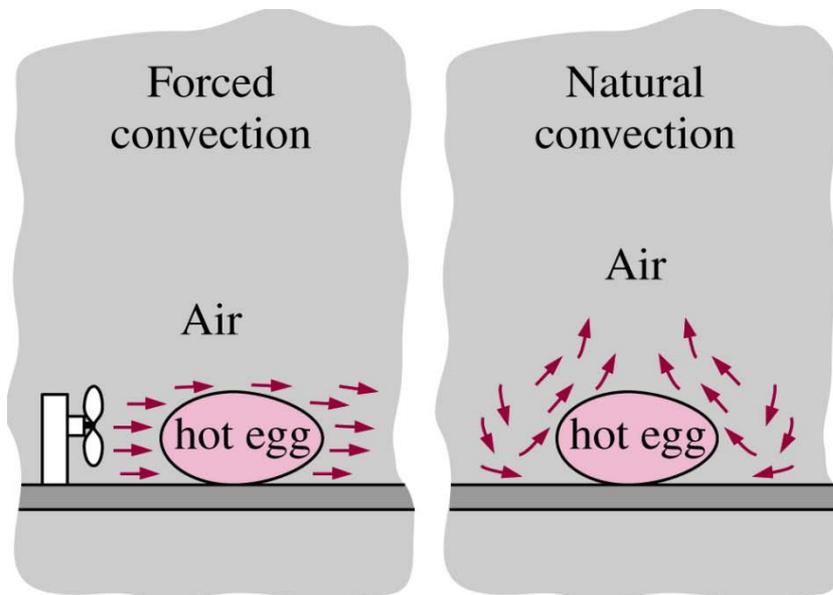
h

A_s

T_s

T_a

Type of convection	h , [$\text{w}/\text{m}^2 \cdot ^\circ\text{C}$]
Free convection of gases	2-25
Free convection of liquids	10-1000
Forced convection of gases	25-250
Forced convection of liquids	50-20000
Boiling and condensation	2500-100000



- Convection heat transfer coefficient is *not a property of fluid*
- It is a function of many variables

$$\bar{h} = h(1 + C_a v^n)$$

h

\bar{h}

C_a

v

n

4. 복사 (radiation)

$$\dot{Q}_{emit} = \varepsilon \sigma A_s T_s^4 \text{ [W]}$$

\dot{Q}_{emit}

ε

σ

A_s

T_s

5. 냉각방법 (cooling method)

Nominal data		Curve	Nominal voltage	Frequency	Air flow	Speed/rpm	Power input	Current draw	Capacitor	Sound pressure level	Max. operative range	Perm. amb. temp.	Mass without attachments
Type	Motor		VAC	Hz	m ³ /h	rpm	W	A	μF/VDB	dB(A)	Pa	°C	kg
*2D 200 ⁽¹⁾	M2D 068-CF	Ⓐ	3~ 230/400	50	830	2800	53	0.26/0.15	—	67	140	-25 to +75	1.7
			3~ 230/400	60	940	3150	70	0.24/0.14	—	70	140	-25 to +75	
*2E 200	M2E 068-CA	Ⓑ	1~ 230	50	740	2740	50	0.24	1.5/400	65	200	-25 to +75	1.4
			1~ 230	60	830	3120	61	0.28	1.5/400	69	200	-25 to +75	
*4D 200 ⁽¹⁾	M4D 068-CF	Ⓒ	3~ 230/400	50	390	1450	22	0.16/0.09	—	51	70	-25 to +60	1.5
			3~ 230/400	60	460	1730	21	0.12/0.07	—	55	100	-25 to +80	
*4S 200	M4S 068-BF	Ⓓ	1~ 230	50	375	1380	40	0.30	—	52	60	-25 to +50	1.2
			1~ 230	60	445	1630	34	0.24	—	53	80	-25 to +65	