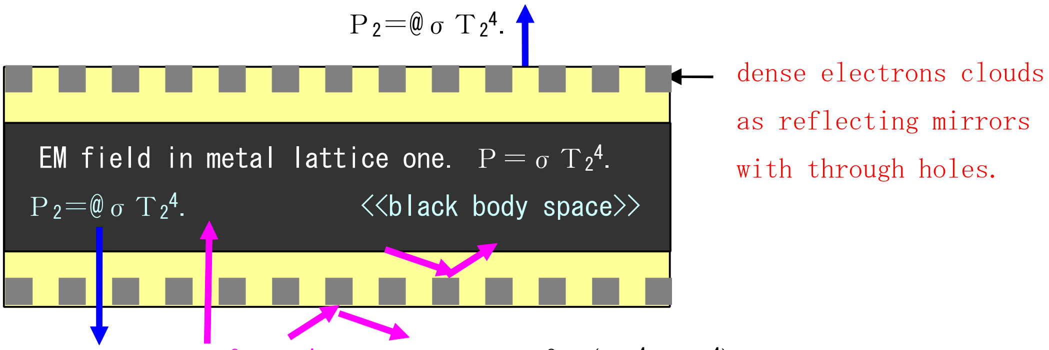
−Heat Insulator by doble Al-shiled− 2011/3/3,

Better heat insulator could be implemented by radiation heat transfer views.

[1]:A simple heat radiation model of metal with radiation rate{@}.

Note blight metal surface is caused from dense electron clouds.

Also note that (metal) radiation rate @ is passing probality of radiation.

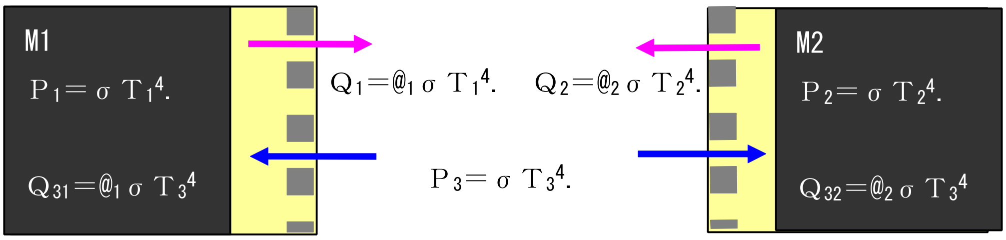


$P_1=@\sigma T_1^4. \rightarrow Q=P_1-P_2=@\sigma(T_1^4-T_2^4).$

[2]:Radiation passing and reflection between metal of radiation rate {@1,@2}.

Originally a non equibrium transport phenomena never be treated by equibrium-thermodynamics.Here is electro-magnetic dynamics of reflection and absorbtion.

Radiation repeating reflection and absorbtion between {M1-M2}is accounted.



$Q_{32}=Q_1@_2\{1+(1-@_2)(1-@_1)+(1-@_2)^2(1-@_1)^2+.........\}$

$\quad +Q_2@_2(1-@_1)\{1+(1-@_2)(1-@_1)+(1-@_2)^2(1-@_1)^2+.........\}$

$*Q_{32}=[@_2/(1-(1-@_1)(1-@_2))][Q_1+Q_2].$ $*Q_{31}=[@_1/(1-(1-@_1)(1-@_2))][Q_1+Q_2].$

$*P_3=\sigma T_3^4=\sigma[@_1T_1^4+@_2T_2^4]/(1-(1-@_1)(1-@_2)).$

$T_3^4=[@_1T_1^4+@_2T_2^4]/(1-(1-@_1)(1-@_2)).$

$Q_1-Q_{31}=Q_1[(1-(1-@_1)(1-@_2))/(1-(1-@_1)(1-@_2))]-[@_1/(1-(1-@_1)(1-@_2))][Q_1+Q_2]$

$=Q_1[(1-1+@_1+@_2-@_1@_2)/(1-(1-@_1)(1-@_2))]-[@_1/(1-(1-@_1)(1-@_2))][Q_1+Q_2]$

$=@_2Q_1[(1-@_1)/(1-(1-@_1)(1-@_2))]-@_1Q_2/(1-(1-@_1)(1-@_2))]$

$=\langle @_2Q_1-@_1Q_2\rangle/(1-(1-@_1)(1-@_2))]=@_1@_2\sigma\langle T_1^4-T_2^4\rangle/(1-(1-@_1)(1-@_2))].$

Thus non-equibrium heat flows are accounted as follows.

$Q_1 - Q_{31} = @_1 @_2 \sigma \langle T_1^4 - T_2^4 \rangle / (1-(1-@_1)(1-@_2))]$.

$Q_2 - Q_{32} = @_1 @_2 \sigma \langle T_2^4 - T_1^4 \rangle / (1-(1-@_1)(1-@_2))] = -(Q_1 - Q_{31})$.

Note distance between {M1-M2} is no concern. Also note $Q_1 - Q_2 = @_1 \sigma T_1^4 - @_2 \sigma T_2^4$ is not correct.

example1 : @(Al)=0.04～0.06、 $Q_1 - Q_{31} = 0.026 \sigma \langle T_1^4 - T_2^4 \rangle$.

	$T_1 = 273+40$	$T_1 = 273+100$	$T_1 = 273+150$
$T_2 = 273+10$	$Q_1 - Q_{31} = 4.7W$	$Q_1 - Q_{31} = 19W$	$Q_1 - Q_{31} = 38W$

$\sigma T(273+100)^4 = 1086 W/m^2$, while $J \equiv (Q_1 - Q_{31})$ are very small flow.

A better heat insulator could be realizable by "Alminum double shielding".

conductivity $\kappa = 0$ of "vaccme" is the best spacer(-bottle),
$\kappa = 0.026$ of air has a defeact of convective heat transfer.
$\kappa = 0.035 W/mK$ of bubble polystyren sheets is the 2nd ?,

example2 : $J_{12} = \kappa_{12} \langle T_1 - T_2 \rangle / d_{12}$. $\kappa = 0.035 W/mK$.

$T_2 = 273+10$	$T_1 - T_2 = 30$	$T_1 - T_2 = 50$	$T_1 - T_2 = 90$	$T_1 - T_2 = 140$
$d_{12} = 0.03m$	$35 W/m^2$	58	105	163
$d_{12} = 0.05m$	21	35	63	98
$d_{12} = 0.10m$	11	18	32	49