

## STEFAN-BOLTZMANN LAW

Josef Stefan determined from experimental data that the total power emitted by a radiant object is proportional to the fourth power of its absolute temperature  $T$ . Five years later Ludwig Boltzmann showed how to derive the same relation from principles of thermodynamics. The modern form of the Stefan-Boltzmann law is

$$P = A\varepsilon\sigma T^4$$

where  $P$  is total power,  $A$  is surface area,  $\varepsilon$  is an emissivity constant, and  $\sigma$  is the Stefan-Boltzmann constant

$$\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$$

For example, consider a one cubic centimeter block of wrought iron at 1000 K. The emissivity constant of wrought iron is  $\varepsilon = 0.94$  hence the total radiant power is

$$P = (6 \times 10^{-4} \text{ m}^2) \times 0.94 \times (5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}) \times 1000^4 \text{ K}^4 = 32 \text{ W}$$

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-- www.eigenmath.org/stefan-boltzmann-law.txt
A = 6 10^(-4) meter^2
epsilon = 0.94
sigma = 5.67 10^(-8) watt meter^(-2) kelvin^(-4)
T = 1000 kelvin
A epsilon sigma T^4
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