Stefan-Boltzmann law

Josef Stefan in 1879 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, ε is an emissivity constant, and σ is the Stefan–Boltzmann constant

$$\sigma = 5.67 \times 10^{-8}\,\mathrm{watt\,meter^{-2}\,kelvin^{-4}}$$

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

$$P = \underset{\text{surface area 1 cm cube}}{6 \times 10^{-4}\,\mathrm{meter^2}} \times 0.94 \times 5.67 \times 10^{-8}\,\mathrm{watt\,meter^{-2}\,kelvin^{-4}} \times 1000^4\,\mathrm{kelvin^4} = 32\,\mathrm{watt}$$