Don't just paint INSULATE!

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# INSULADD AND THERMAL RADIATION

**All objects give off radiation, i.e., electromagnetic waves, because of their temperature; we refer to this as *thermal radiation.* As well they absorb such radiation from their surroundings. If a body is hotter than its surroundings it emits more radiation than it absorbs, and tends to cool; if a body is cooler than its surroundings it absorbs more radiation than it emits, and tends to warm.**

**Thermal radiation is the emission of electromagnetic waves from all matter that has a temperature greater than absolute zero. It represents a conversion of thermal energy into electromagnetic energy. Thermal energy is the collective mean kinetic energy of the random movements of atoms and molecules in matter. Atoms and molecules are composed of charged particles, i.e. protons and electrons and their oscillations result in the electrodynamic generation of coupled electric and magnetic fields, resulting in the emission of photons, radiating energy and carrying entropy away from the body through its surface boundary. Electromagnetic radiation, or light, does not require the presence of matter to propagate and travels in the vacuum of space infinitely far if unobstructed.**

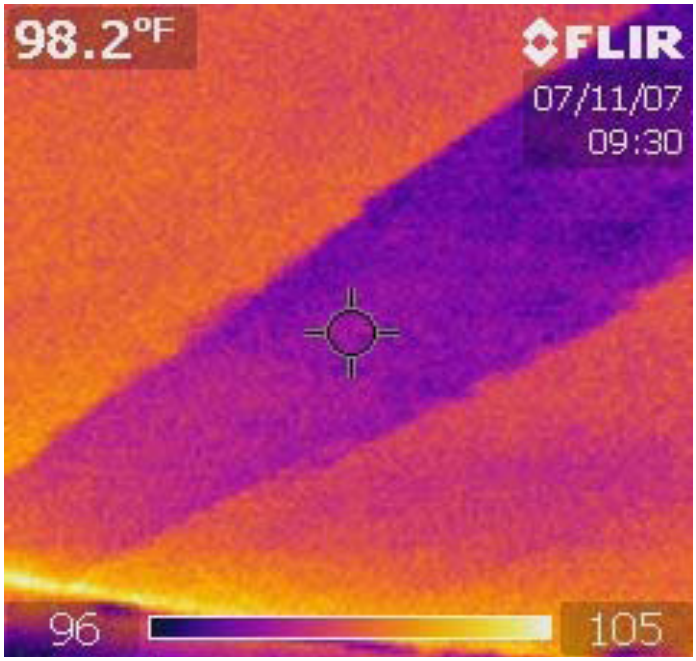
**The characteristics of thermal radiation depends on various properties of the surface it is emanating from, including its temperature, its spectral absorptivity and spectral emissive power. The radiation is not monochromatic, i.e. it does not consist of just a single frequency, but comprises a continuous dispersion of photon energies, in its characteristic spectrum. Fireplaces, heaters, and all other objects as well as people in a home emit thermal radiation however the frequency of this radiation is much lower than that of Solar radiation.**

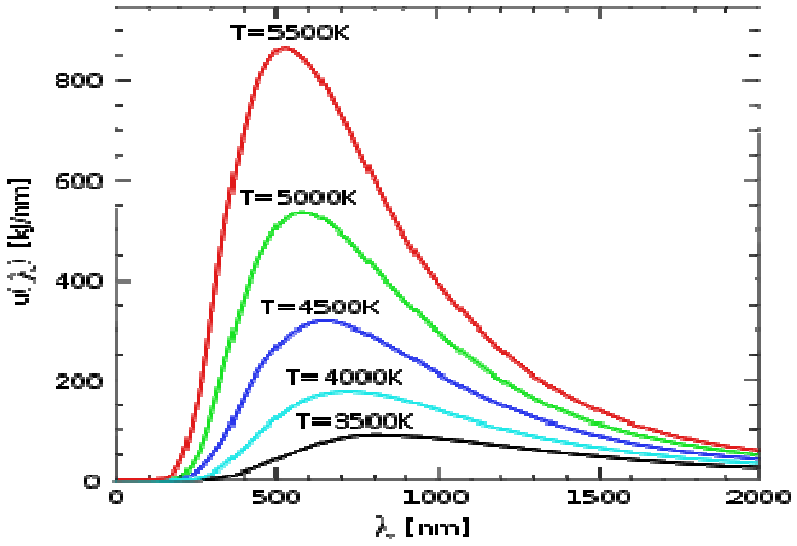
## Surface effects

**Lighter colors and also whites and metallic substances absorb less illuminating light, and thus heat up less; but otherwise color makes small difference as regards heat transfer between an object at everyday temperatures and its surroundings, since the dominant emitted wavelengths are nowhere near the visible spectrum, but rather in the far infrared. Emissivities at those wavelengths have little to do with visual emissivities (visible colors); in the far infrared, most objects have high emissivities. Thus, except in sunlight, the color of clothing makes little difference as regards warmth; likewise, paint color of houses makes little difference to warmth except when the painted part is sunlit.**

**The main exception to this are materials which have low emissivities both in the visible wavelengths and in the far infrared. Insuladd has a very low emissivity and is surrounded by paint film that has a high emissivity thus forming a composite on the surface to which it has been applied. Such surfaces can be used to reduce heat transfer in both directions; an example of this is the multi-layer insulation used to insulate spacecraft.**

**Insuladd is formulated to yield paint with high diffuse reflectance of ultraviolet, visible, and near and far-infrared wavelengths. This can be seen by using an IR or Thermal Imaging Camera and viewing a surface painted with Insuladd. Insuladd works inside and outside. Paint alone does not possess a high diffuse reflectance as can be seen in the Thermal images below.**




**The diagram above shows how the peak wavelength and total radiated amount vary with temperature . Although this plot shows relatively high temperatures, the same relationships hold true for any temperature down to absolute zero. Visible light is between 380 and 750 nm.**

**KEY POINTS:**

1) **All objects give off radiation, i.e., electromagnetic waves, because of their temperature; we refer to this as *thermal radiation.* As well they absorb such radiation from their surroundings.**

2) **Fireplaces, heaters, and all other objects as well as people in a home emit thermal radiation however the frequency of this radiation is much lower than that of Solar radiation.**

3) **Lighter colors and also whites and metallic substances absorb less illuminating light, and thus heat up less; but otherwise color makes small difference as regards heat transfer between an object at everyday temperatures and its surroundings, since the dominant emitted wavelengths are nowhere near the visible spectrum**

4) **Insuladd has a very low emissivity and is surrounded by paint film that has a high emissivity thus forming a composite on the surface to which it has been applied. Such surfaces can be used to reduce heat transfer in both directions; an example of this is the multi-layer insulation used to insulate spacecraft.**

5) **Insuladd is formulated to yield paint with high diffuse reflectance of ultraviolet, visible, and near and far-infrared wavelengths.**

6) **Paint alone does not possess a high diffuse reflectance.**