How Infrared Light Interacts With Aluminum

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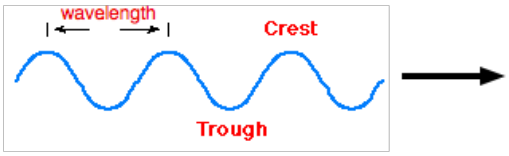
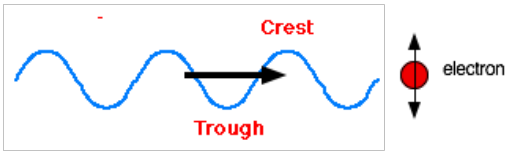
Understanding the operation of infrared light reflectors (radiant barriers) requires knowing something about infrared radiation and how it interacts with materials like aluminum.

Infrared radiation is a form of electromagnetic radiation. We are most familiar with the form of electromagnetic radiation is visible light. Light and infrared radiation are "waves" in which an electric field and a magnetic field oscillate together in space. The wavelength (distance between crests of the wave) of infrared radiation is longer than for visible light - yet less than 0.01 millimeters. Longer wavelengths correspond to lower frequencies.

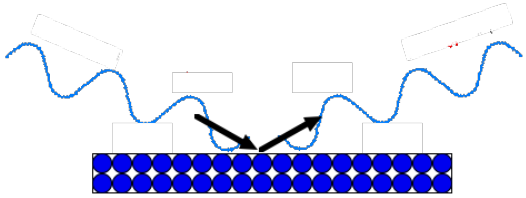


Solids are made up of atoms which are bound together and atomic nuclei are bound together tightly enough that they do not move easily. Many metals, such as aluminum, have electrons surrounding the atoms which can be moved easily. Free electrons explain why metals are typically good electrical conductors.

When infrared light strikes a metal surface, the oscillating electric field in the light causes the free electrons to begin oscillating at the same frequency as the infrared light wave.



When free charged particles, like electrons, oscillate, they produce new radiation which has the same frequency and wavelength of the incident radiation.



The oscillating electric field in the infrared light sets the electrons in aluminum vibrating and they, in turn, return most of the radiant energy as identical infrared light at the same angle the incident radiation entered.

For aluminum, an excellent, most inexpensive infrared reflector, approximately 97% of the incident radiation returns to the air. Only 3% continues into the solid where it interacts with other electrons.