

### COATING MATERIALS & PROCESSES FOR THE LONG-WAVE THERMAL BAND



**Mobile High-Energy Laser-Equipped tank can shoot a drone out of the sky using a laser. (U.S.Army/C.T.Lopez)**

*Authors: Samuel Pellicori and David Sanchez*

In the last issue of Coating Materials News, the partial spectral overlapping applications of coating materials as the spectrum is traversed from visible (VIS) to infrared (IR) wavelengths was discussed. That overlap only pertained to wavelengths to  $\sim 5\mu\text{m}$ , and was satisfied by oxide and fluoride compounds. Longer wavelengths require different materials that exhibit low absorption. Additional properties are ease of deposition, available starting forms and conditioning, and the mechanical properties of the deposited film layers. First, we will review the IR spectrum.

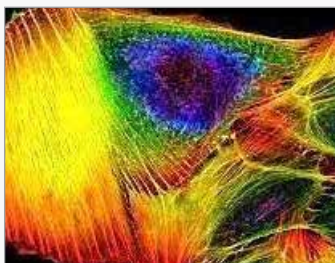
### Sensing and Imaging Objects by Solar Irradiation

Solar spectral emission conforms to  $\sim 6000\text{ K}$  black body radiation that peaks near  $450\text{ nm}$  and supplies energy for human and animal vision as well as vegetation processes. Solar energy dwindles to smaller values as longer wavelengths are approached. The human eye has a spectral response between  $\sim 380$  to  $720\text{ nm}$ , with its photopic response peaking at  $550\text{ nm}$  for bright light (daylight) and  $\sim 520\text{ nm}$  for scotopic response at low light level (moon light). [Read more...](#)

### ION BEAM SPUTTERING FOR DENSE OXIDE COATINGS

*Authors: David Sanchez and Samuel Pellicori*

High-energy deposition processes produce desirable film qualities that provide high transmission, stability to external environmental influences, resistance to laser damage by high-energy lasers, and low stress. These processes rely on the creation of high-energy ions and plasmas to provide the kinetic energy and reactivity necessary to deposit dense film layers. By way of comparison of process energies, the energy provided by resistance-heated evaporation is a few  $10^3\text{ eV}$ . High substrate temperature  $\sim 300\text{ }^\circ\text{C}$  is required with resistance-heated evaporation to supply kinetic energy to mobilize the arriving adatoms and produce moderately dense microstructures. When augmented by simultaneous heavy-ion bombardment ( $\text{Ar}^+$ ) with energies of  $\sim 50\text{-}70\text{ eV}$  in the process called Ion Assisted Deposition (IAD), the thermal films can be compacted to an amorphous microstructure of higher densities. More complete oxidation also results in the process in which reactive oxygen ions are also produced. The results are films that meet the already mentioned favored qualities to varying degrees. [Read more...](#)



**Confocal microscopy is a critical biological application requiring low loss thin film stacks enabled by IBS. (Wikipedia Commons)**

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