

The Cutting Edge of...LED Materials

First, what is reflectivity and how does that compare to something like gloss. The reflectivity is how much of the light that strikes a material is reflected back and in what spectrum. Gloss can be thought of in terms of how shiny a surface is at a given angle relative to the light striking the surface. So gloss is dependent on the surface of a material, while reflectance is dependent on the color of the material. Refer to the chart below for examples of how the two properties compare.

| | High Reflectance | Low Reflectance |
|------------|--------------------------|-----------------|
| High Gloss | Ex. Mirror | Ex. Black glass |
| Low Gloss | Ex. Movie theater screen | Ex. Asphalt |

Comparison examples of gloss and reflectance

Second, in just about every high reflective coating in the world, TiO_2 (Titanium Dioxide) is used to achieve high reflectance. There are two types of TiO_2 , rutile and anatase, and they are used for different purposes in white materials. Rutile is the most common form of TiO_2 , and is used to give a coating opacity (or hiding power in paint terms). Rutile materials have very good UV absorption properties, so it is used in things like sunscreen and cosmetics as well as coatings. Anatase TiO_2 is the rarer form of TiO_2 and is used to achieve high reflectivity in white coatings. This high reflectivity comes with a higher raw material price tag, but also allows for coating properties such as the ability to photoimage (which is very important for solder masks). Other things that can affect the reflectivity of a TiO_2 are the presence of impurities. Iron is a naturally occurring impurity in TiO_2 that is very common and can give it a red tint. High reflective TiO_2 needs to go through a number of specialized separation processes in order to remove the impurities.

Hopefully, this will clarify some of the basic terms that you hear when talking about white solder masks for LED applications.