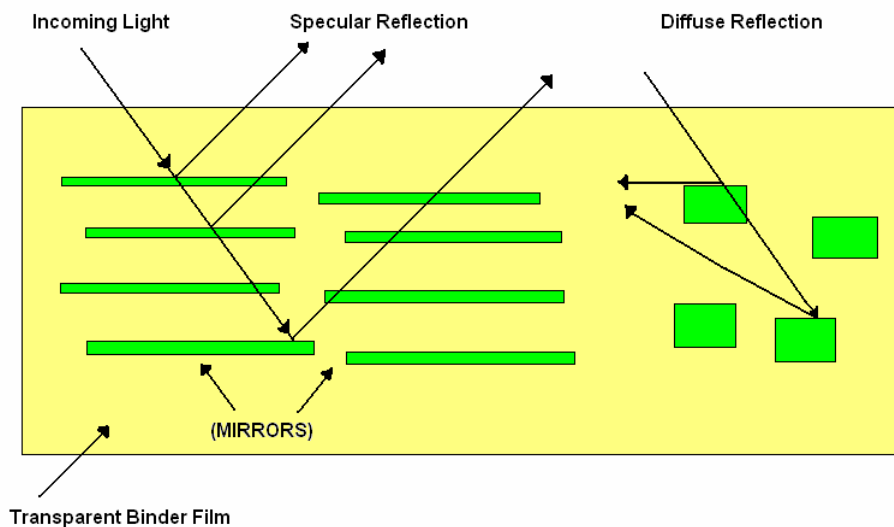


SPECULAR REFLECTION

Mirror Reflection in Paint



Above, we show transparent paint film having mirror particles suspended within it. The mirror particles are flat and others are square. As we'll see, the flat mirrored particles are more successful at creating what is known as *specular reflection*, where the angle of reflection equals the angle of incidence of the incoming light. Specular reflection is good for the creation and control of the preferred visual effects. The square particles tend to create what is known as *diffuse reflection*, where the angle of reflection designer's ability to create and control the desired effects.

In order to best generate specular reflection in paint, the particles must have the following characteristics:

- **Optical Properties** – They must be transparent and have high refractive index, which means they must partially reflect and partially transmit light.
- **Size** – They must be smaller than about 30 microns, so as not to protrude through the base coat film, which is typically less than 30 microns deep. They should be even smaller, to allow for layering of the particles within the film. Specular reflection from several layers within the film produces the important illusion of depth.
- **Shape** – They must be flat, not square or round. Particles with high aspect ratio – the ratio of length to height – have greater surface area for creating specular reflection and, as a whole, fewer edges that tend to create diffuse reflection.

Particles that exhibit all of these characteristics are not easy to come by naturally or even to produce. Most often, the particle is actually a composite of different materials. For example, one of the most common pigment particle – titanium dioxide coated mica – uses mica as the base particle because it is transparent and after processing, has the desired size and shape characteristics. Mica does not have a high refractive index, however, so the base particle is coated with another material that does, TiO₂. Pigment particles will normally have an additional coating of colorant material. And exterior-grade pigments – like those used in automotive paint – require final surface treatment coatings to protect against paint degradation that is caused by exposure to UV radiation and abrasion from weathering and cleaning.