

OPACITY TEST F BLACK RUB



Opacity Test for Black Films

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Purpose

For some applications, the opacity of films is a key parameter. For instance, the content of refuse sacks needs to be hidden, some agricultural mulch films must show a certain opacity level in order to prevent the weeds from growing.



Measurement Principle

"Opacity is the extent to which a medium is opaque, i.e. not transparent".

Pigments are well known to confer opacity to a film. Carbon black exhibits a high opacifying power, i.e. a great ability to stop the transmission of light through a film.

The transmission of light through a film is governed by the general law of chemistry entitled "Beer-Lambert Law".

Applied to carbon black based films, the equation is:

$$\log (I_0 / I) = a * t * c$$

I_0 = intensity of incident light (lux)

I = intensity of light transmitted through the film (lux)

a = absorption coefficient, function of the type of carbon black and polymer (*)

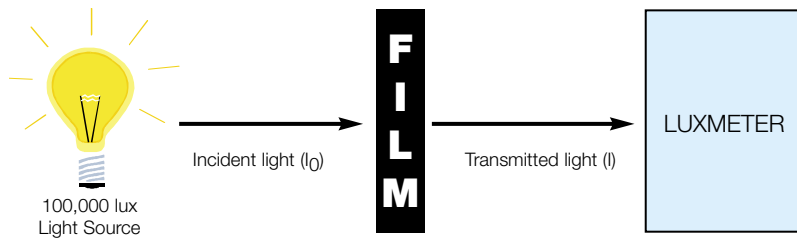
t = thickness of film (μm)

c = carbon black concentration (wt %)

(*) Using purposely always the same polymer (LDPE) entering in the film composition, the absorption coefficient (a) is only a function of the carbon black type.

Testing

- The carbon black to be assessed is efficiently dispersed in an LDPE matrix; this consists in the masterbatch production.
- This masterbatch is diluted to obtain homogeneous compounds containing carbon black ranging from 0.5 to 2.5 %.
- 50 µm films are produced from these compounds and their thickness is accurately measured.
- The black film sample is placed between a powerful light source of 100,000 lux and a luxmeter, which measures the number of lux transmitted through the film.



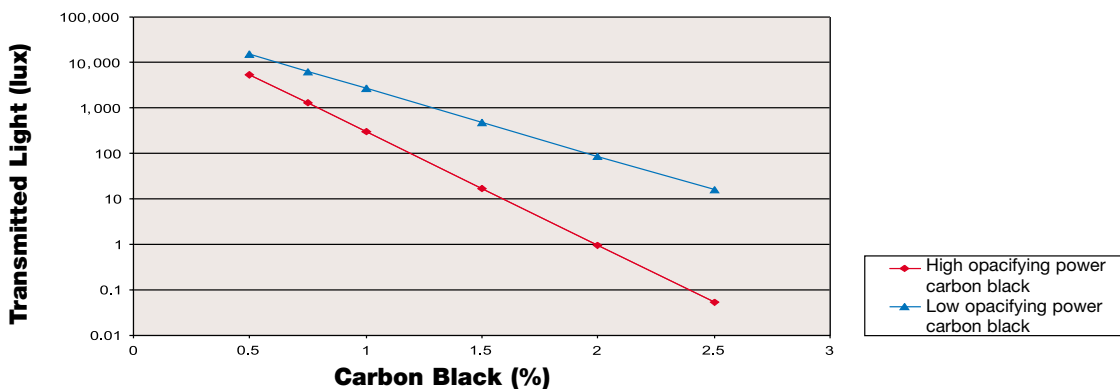
- The Beer-Lambert equation is then used to calculate the absorption coefficient of the black film:

$$a = \frac{\log (I_0 / I)}{t * c}$$

The higher the absorption coefficient of the film, the better its opacity.

Opacifying Power of Carbon Black

Transmission of light through 50 µm films containing various types and percentages of carbon black



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