# Carbon Blackness [My], Jetness [Mc], Undertone [dM] and Tint Strength [T]

“Carbon black, also called charcoal black lamp black, pigment black, soot or black carbon, is a fine particle carbon pigment obtained as soot from the incomplete combustion of many different types of organic materials, such as natural gas, or oil. Carbon black is usually a fine, soft, black powder. It is very stable and unaffected by light, acids and alkalis. It is commonly used in printing and lithograph inks and in Chinese ink sticks. In industry, carbon black is used as a filtration material and a filler /pigment in coatings, rubber, plastics, paints, carbon paper, and crayons.

Some synonyms for carbon black pigment —- Channel black; lampblack; Pigment Black 6 and 7; CI 77266; gas black; diamond black; smoke black; soot black; flame black; furnace black; acetylene black; thermal black; graphite; charcoal black; coal black; bone black; vine black; sumi (Jap.); hiilimusta (Fin.); nero di carbone (It.); noir de carbone (Fr.).” Source: Dandong MB Carbon Black Pigment Co., Ltd, Chinahttp://www.mbssth.com

For how black is black, there are 3 metrics used to quantify the color quality of black created in a coating, plastic and rubber substrates.

**Blackness My** is a measure of the degree of blackness, directly related to the reflectance. Typical reflectance values are typically below 5% and can be below 1% for the best blacks. The bottom-of-scale standardization of the instrument sets a measured reference for 0%.

Blackness My = 100*log (Yn/Y)

**Jetness Mc** is the color dependent black value developed by K. Lippok-Lohmer. As the Mc value increases, the jetness of the masstone increases. Sample preparation is typically based on an opaque drawdown of a black masstone based on black pigment and binder.

Jetness Mc = 100*[ log(Xn/X) – log(Zn/Z) + log(Yn/Y) ]

- Test sample is typically measured with a directional 45/0 instrument geometry
- Xn = 94.811, Yn = 100.000, Zn = 107.304 are the CIE White Point values for D65/10 conditions
- X, Y, Z are the CIE tristimulus values for the sample being measured

**Undertone dM** quantifies how neutral the black pigment + binder is. As Mc = dM + My,

Undertone dM = Mc – My

- If dM < 0, the undertone is brown-reddish
- A dM value = 0 would suggest the black is perfectly achromatic or neutral
- If dM > 0, then the black exhibits a bluish undertone which is often preferred

**Industrial References for Blackness [My], Jetness [Mc] and Undertone [dM]**

**European Coatings Handbook – Thomas Brock, Michael Groteklaes, Peter Mischke**, Vincentz Network GmbH & Co KG, 2000 has a good overview of black pigments and blackness measurement.

**Lippok-Lohmer, Farbe+Lack, 92, p. 1024 (1986)** describes both Jetness [Mc] and Undertone [dM].

**DIN 53235 Testing of pigments – Tests on specimens having standard depth of shade** describes Jetness [Mc].

**DIN 55979 Testing of pigments – Determination of the black value of carbon black pigments** describes Blackness [My].

# Carbon Black Tint Strength [T]

As referenced in **ASTM D3265**, Carbon Black Tint is a measurement of reflectivity for calculation of tint strength as:

# Carbon Black Tint Strength [T] = (I/S) x 100

where:  S = Y C/2 reflectance reading of sample

I = Y C/2 reflectance reading of ASTM Tint Reference Carbon Black

- I and S correction coefficients are determined empirically per ASTM D3265.
- The carbon black sample is let down in a standard ASTM Tint Zinc Oxide White base.
- The industry tint reference carbon black and zinc oxide white are available from ASTM www.astm.org .

# Industrial References for Carbon Black Tint Strength [T]

**ASTM D3265 Carbon Black – Tint Strength**

“A carbon black sample is mixed with a white powder (zinc oxide) and a liquid vehicle (soybean oil epoxide) to produce a black or gray paste. This paste is then spread to produce a surface suitable for measuring the reflectance of the mixture by means of a photo-electric reflectance meter. The reflectance of the tested sample is then compared to the reflectance of the ITRB prepared in the same manner. The tint strength of the tested sample is expressed as units of the reflectance of the ITRB divided by the reflectance of the sample and multiplied by 100.”
ASTM www.astm.org