

paintistanbul TURKCOAT CONGRESS

How to Manage LiDAR Compliance in Black Colors?

Merve Samiye Kirazlı

Kansai Altan Boya Sanayi A.Ş

LiDAR Technology and its Role in Autonomous Driving

Remote sensing technology

Measures distance and depth

Essential for autonomous driving

Analyzing NIR laser reflection

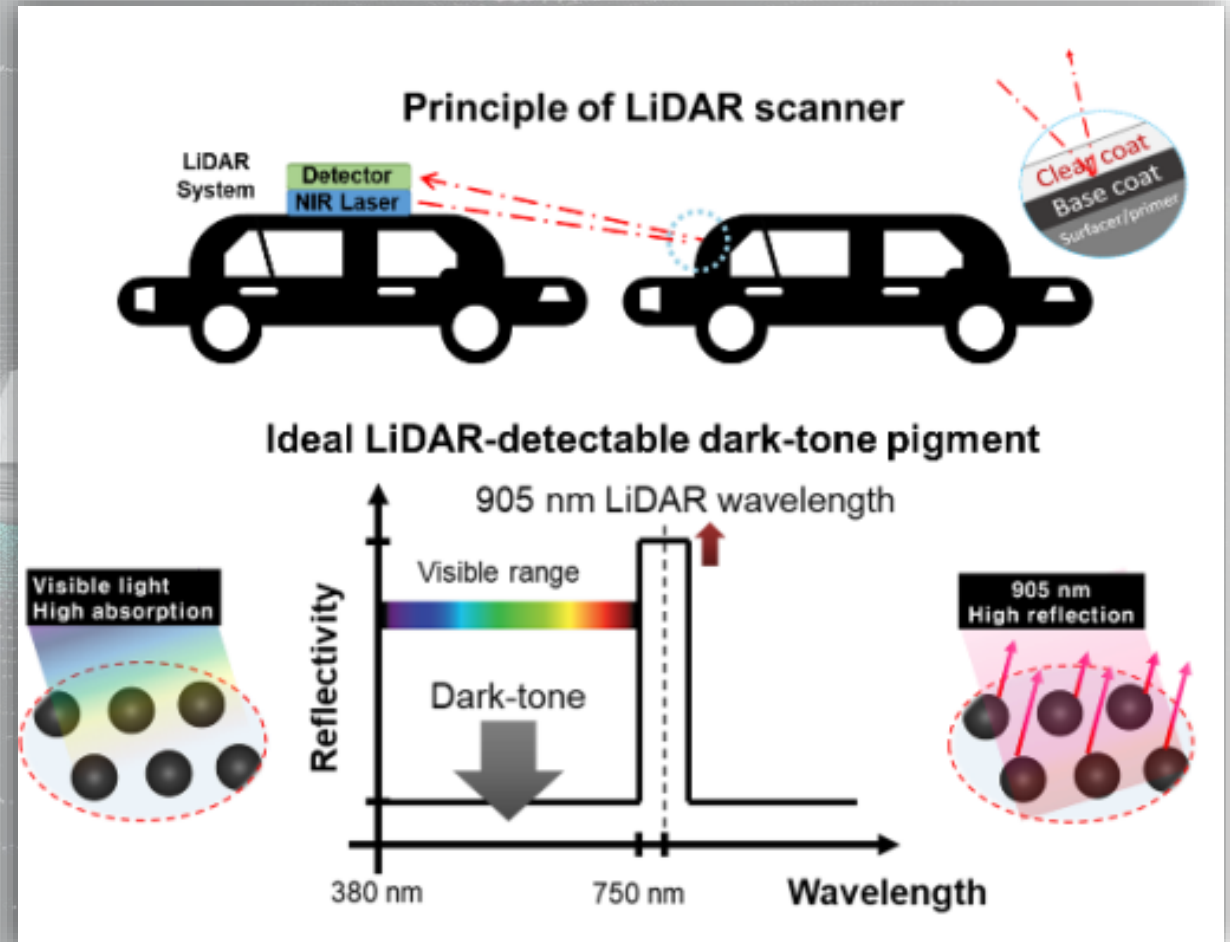
High resolution 3-dimensional data

Real time accurate environmental mapping

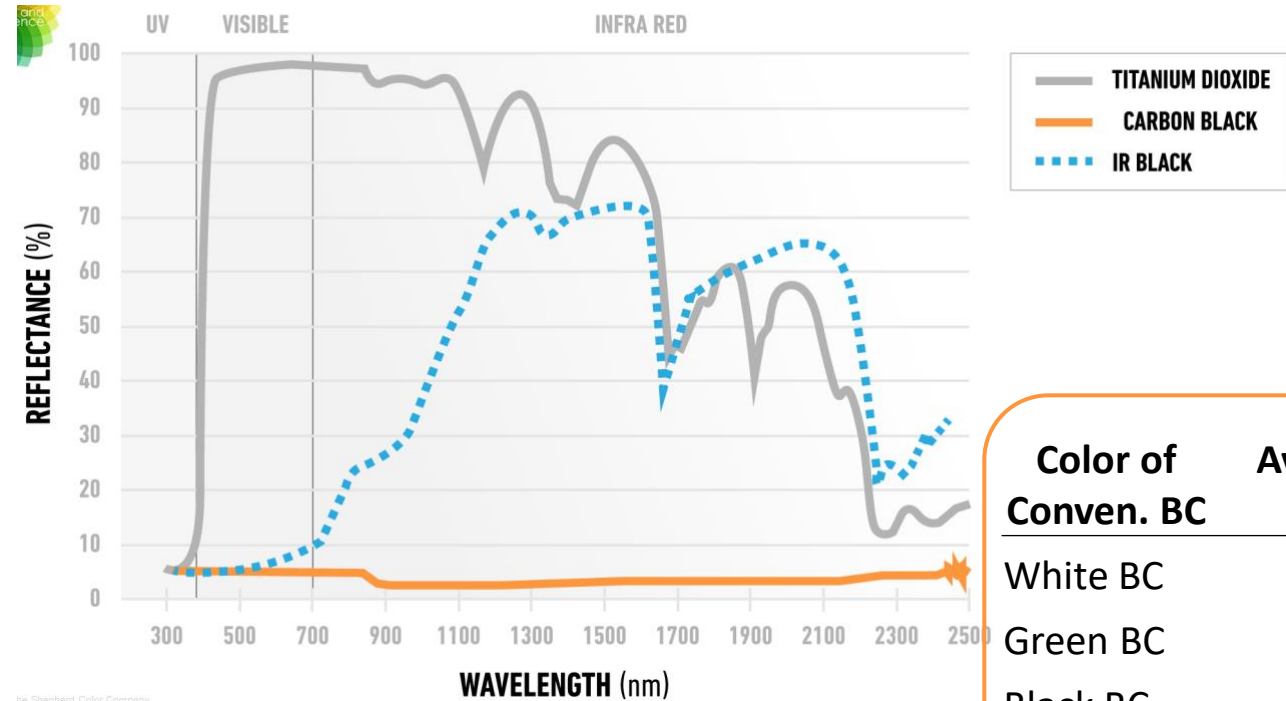
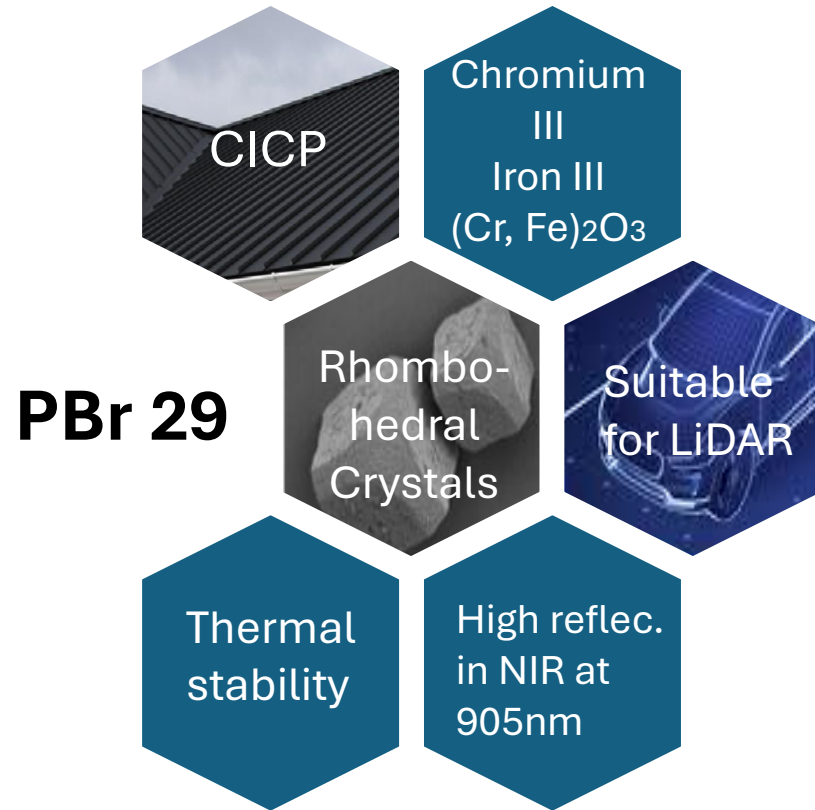
Challenges of Dark-Colors in Lidar Detection

Conventional black pigments, especially **carbon black**, absorb most of the incident NIR light, including the **905 nm** wavelength used in LiDAR systems.

As a result, these surfaces appear nearly **invisible** to LiDAR scanners, significantly impairing detection in autonomous vehicles and increasing collision risks.



NIR-Reflective Pigment Technology



Color of Conven. BC	Ave.Lidar Signal
White BC	70%
Green BC	23%
Black BC	7%

Performance of PBr 29 Grades

- Blackness: My

$$My = 100 \cdot \log\left(\frac{100}{Y}\right)$$

- Jetness: Mc

$$Mc = 100 \cdot \left(\log\left(\frac{X_n}{X}\right) - \log\left(\frac{Z_n}{Z}\right) + \log\left(\frac{y_n}{Y}\right) \right)$$

- Undertone: dM

$$dM = Mc - My$$

dM>0 → bluish

dM<0 → brownish

- R%, 905nm (NIR reflectance at 905 nm)
- TSR% (Total solar reflectance)

	Pigment-1	Pigment-2
L*	8,54	9,5
a*	4,48	3,29
b*	3,12	2,55
R% _{905nm}	27,6	24,7
My	198,4	197,4
Mc	194,4	185,7
TSR%	21,69	21,42



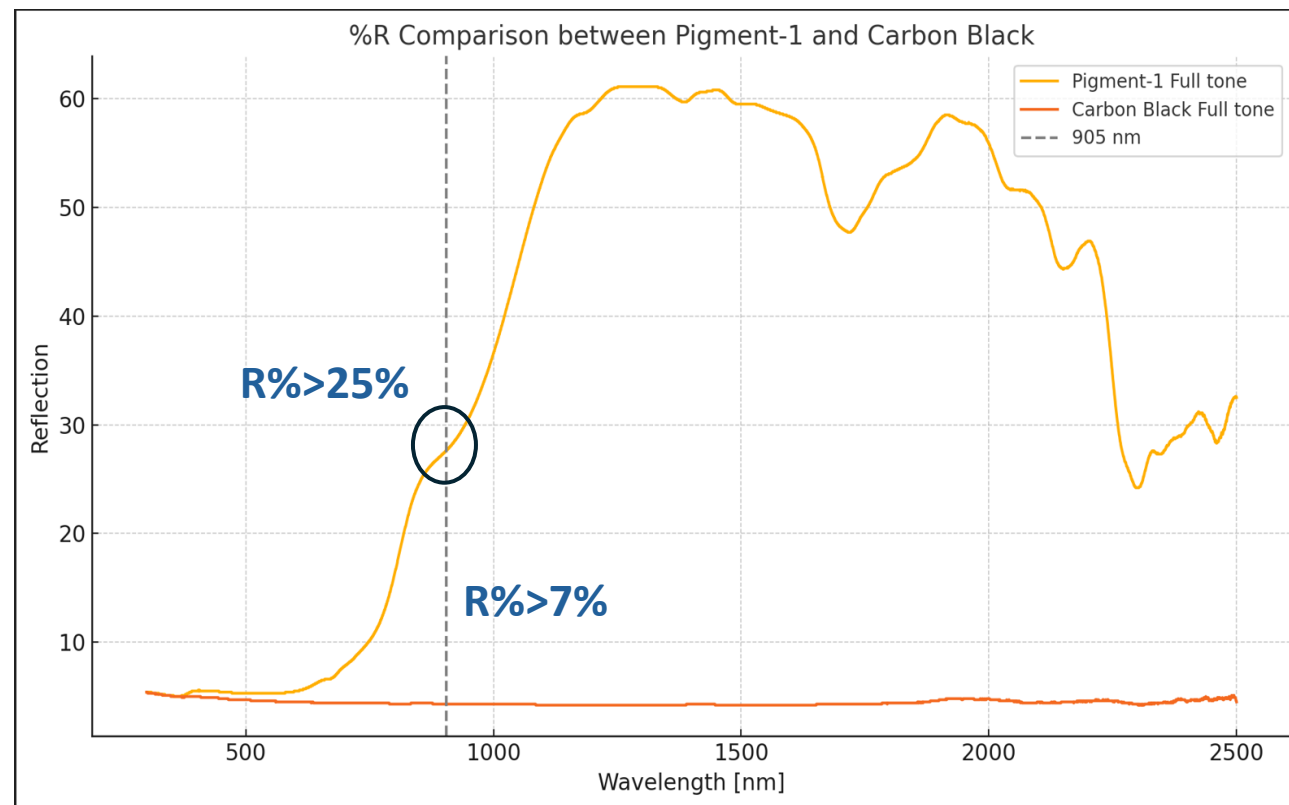
Pigment-1

Pigment-2

Comparison of PBr29 vs Carbon Black



	Pigment-1 Full tone	Carbon Black Full tone
L	8,54	4,98
a	4,48	0,27
b	3,12	0,65
R% 905nm	27,6	5
My	198,4	225,8
Mc	194,4	221,9
%TSR	21,69	4,97

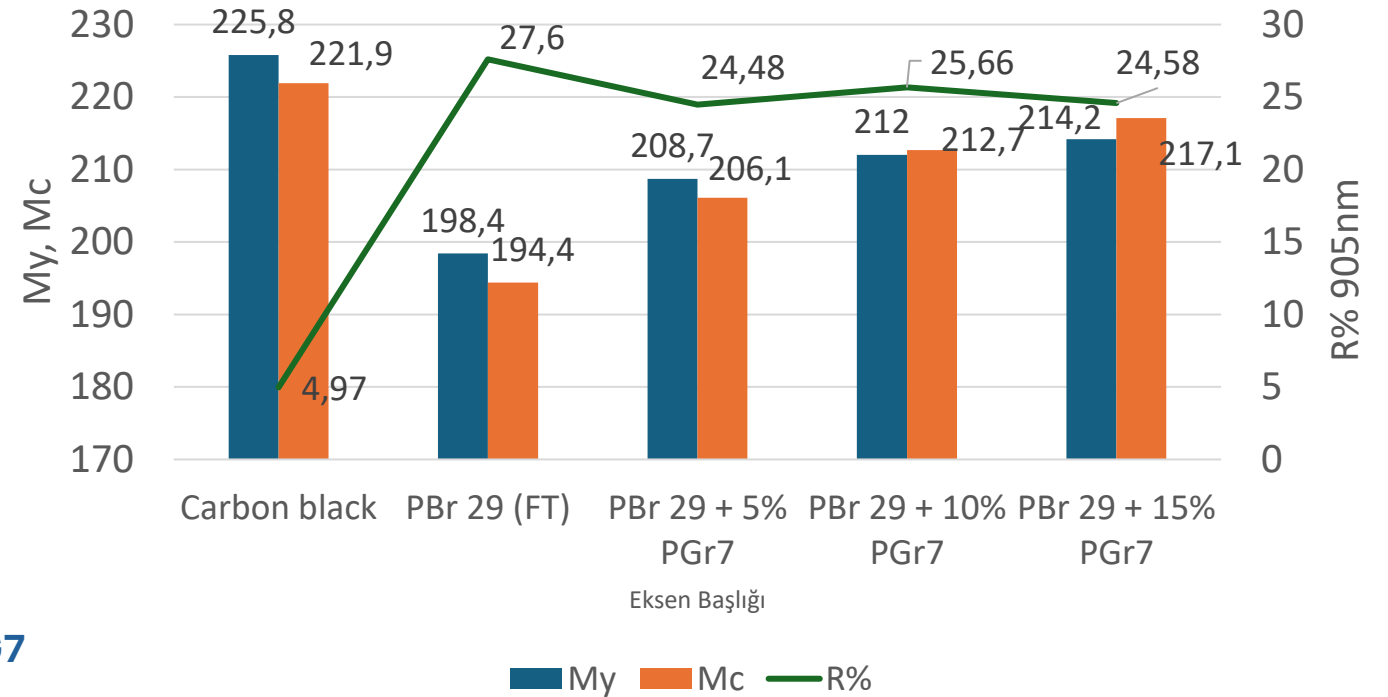


Color Tuning Strategy with PG 7



PBr29 Full Tone + 5% PG7 + 10% PG7 + 15% PG7

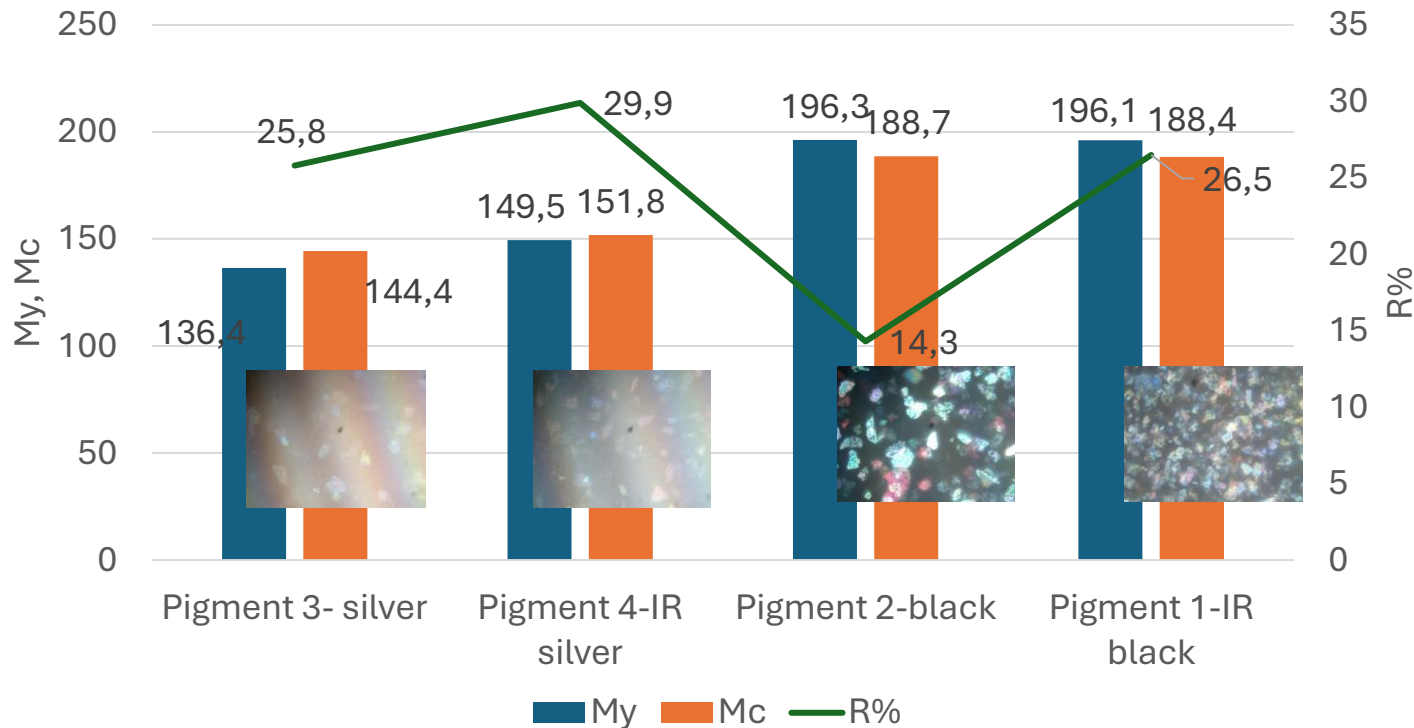
Effect of PGr 7 Additon to PBr 29



Effect of Pearlescent Pigment on PBr29 LiDAR Visibility



Comparison of My, Mc, R%



Conclusion

- Compared to carbon black, which reflects only 7% in the NIR region, Pigment Brown 29 significantly enhances LiDAR compatibility by achieving reflectance levels above 25%.
- Color tuning strategy developed by incorporating Phthalocyanine Green (PG7) into the formulation with PBr 29 deepens black appearance without significantly compromising near-infrared (NIR) reflectance.
- It is possible to achieve sparkle and high blackness in IR-reflective pearlescent pigments + PBr29 without compromising IR reflectance.

Thank you

