Engineering Materials

SPECIALTY CARBONS FOR RESIN & PAPER BONDED FRICTION MATERIALS

TIMREX® Graphite

TIMREX® C-THERM™ Graphite

TIMREX® Coke

ENSACO® Carbon Black

Designed by granstudio

www.imerys-graphite-and-carbon.com

IMERYS Graphite & Carbon

INNOVATIONS TO POWER EVERYDAY LIFE

Imerys Graphite & Carbon

A STRONG COMPANY

Imerys Graphite & Carbon, member of the Imerys Group, is the reference for innovative capability in the field of carbon-powder-based solutions: natural graphite and synthetic graphite powders, conductive carbon blacks, as well as silicon-carbon composites and water dispersions.
High standards in terms of employee health and safety, social behaviour and environmental responsibility are core values of the company, which is capturing opportunities by developing new products and applications, investing in assets & people, and growing its commercial presence worldwide.

500 Employees Worldwide

40 Countries

5 Industrial Sites

2 R&D Centers

Since 1908

FINANCIAL STRENGTH

Profitable company, part of Imerys, the world leader in mineral-based specialty solutions for industry, listed on the Paris stock exchange

RELIABLE PARTNER

INNOVATION STRATEGY
- Focused on the market and the Customer's needs

SECURITY OF SUPPLY
- 6 Industrial sites

OUR DRIVING FORCE
- Customer Service

RESPONSIBLE GROWTH

COMMITMENT TO
- Green Technology and Sustainable Development

REDUCTION OF
- CO_2 Footprint

ENGAGEMENT WITH
- Local Communities

IMERYS GROUP 2018

WORKFORCE	17,800
REVENUE GROWTH	6.8%
OPERATING SITES	230

Our Value Proposition

VALUE PROPOSITION

We at Imerys Graphite & Carbon deliver tailor made solutions for Friction Material applications with superior consistency of key product parameters: Purity, Crystallinity, Particle Size Distribution, and Oversize Control.

FINAL APPLICATIONS

- Low-steel brake pads
- NAO brake pads
- Cu-free brake pads
- Brake shoes
- Organic bonded clutch facings
- Paper bonded clutch facings

Our portfolio of carbon materials and R&D efforts addresses the key requirements of the friction materials industry.

CUSTOMIZABLE SOLUTIONS

Key Performance Requirements (of brake pads)	**Related Graphite Properties**	**Recommended Graphite Grades**
Stable friction coefficient	High crystallinity High thermal conductivity	**TIMREX®KS** **TIMREX®T** **C-THERM™**
Low fading	High thermal conductivity	**C-THERM™**
Low wear, low dust emissions	High thermal conductivity	**C-THERM™**
Noise reduction, Vibration damping and low disc drag	High spring-back	**TIMREX®T**
Copper Free (environmentally friendly)	High thermal conductivity	**C-THERM™**
Low corrosion	High electrical conductivity for electrostatic painting	**C-THERM™**

NOISE REDUCTION

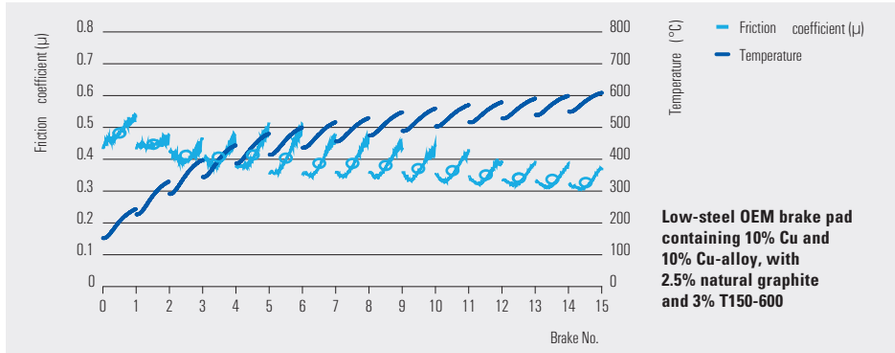
Low noise is an important factor for end consumer's perceived quality of product, especially for electric vehicles where there is no noise from the engine.
Test results show that TIMREX® Tgraphite is very effective in reducing noise, owing to its high amount of porosity and high spring-back. Best results are achieved with a combination of T150-600 graphite and C-THERM™ thermally conductive lubricant as seen below.

Details of the test can be found in ref [1]

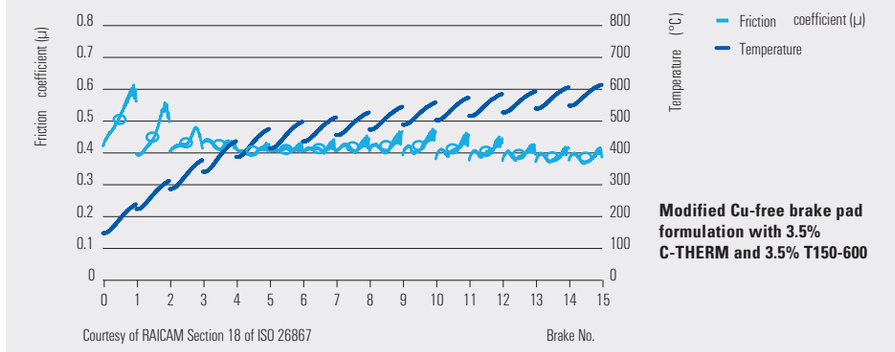
Simplified Cu-Free NAO Formula	Constant Speed	Linear Decreasing Speed
Without Graphite	12700 Hz - 92 dB 9300 Hz - 106 dB 4600 Hz - 90 dB 1700 Hz - 96 dB	12700 Hz - 95 dB 9300 Hz - 106 dB 6200 Hz - 91 dB 1700 Hz - 86 dB
KS150-600 (8%)	9300 Hz - 92 dB 6200 Hz - 106 dB 3000 Hz - 90 dB	12700 Hz - 84 dB
T150-600 (8%)	6200 Hz - 91 dB	**No Noise (<80 dB)**
T800 (8%)	**No Noise (<80 dB)**	**No Noise (<80 dB)**
T150-600 (4%) +C-THERM (4%)	**No Noise (<80 dB)**	**No Noise (<80 dB)**

FADE RESISTANCE

Safe friction materials must be able to maintain thermal stability in the harshest braking conditions in order to prevent the dangerous phenomenon of brake fade. As illustrated in the following table, tests prove that introducing C-THERM™ thermally conductive lubricant in friction materials produces a consistently high and stable friction coefficient.



Low-steel OEM brake pad containing 10% Cu and 10% Cu-alloy, with 2.5% natural graphite and 3% T150-600



Modified Cu-free brake pad formulation with 3.5% C-THERM and 3.5% T150-600

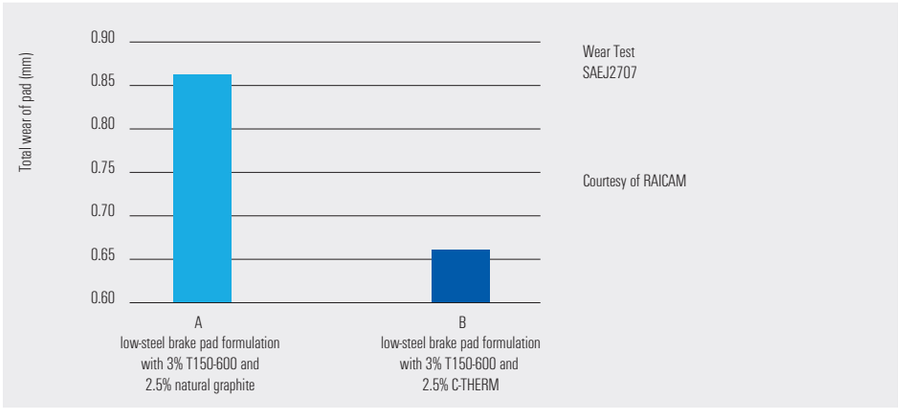
Courtesy of RAICAM Section 18 of ISO 26867

Carbon Solutions for Friction Materials

WEAR RESISTANCE

Thermal stability is not only a relevant characteristic in terms of safety, but is also an important factor in the reduction of wear in friction materials. The ability to withstand high-temperature braking conditions increases product longevity and reduces harmful dust emissions.

Replacing Natural Graphite with C-THERM™ reduces wear of the brake pad



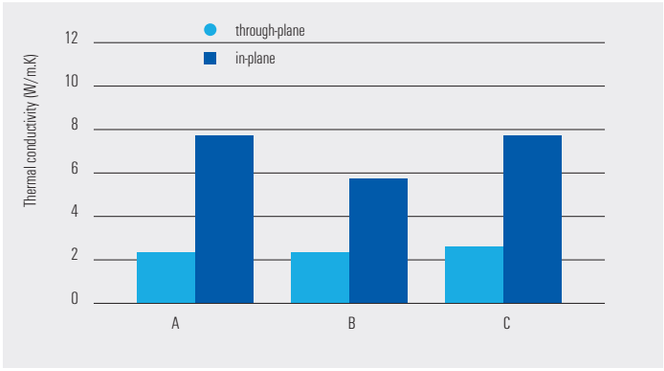
COPPER SUBSTITUTION

C-THERM™ is an excellent additive in copper free friction materials as it provides:

- High thermal conductivity
- Stabilization of the friction coefficient
- Wear reduction

The chart below illustrates how C-THERM™ thermally conductive lubricant drastically improves thermal conductivity in friction materials.

Low Steel Formulation

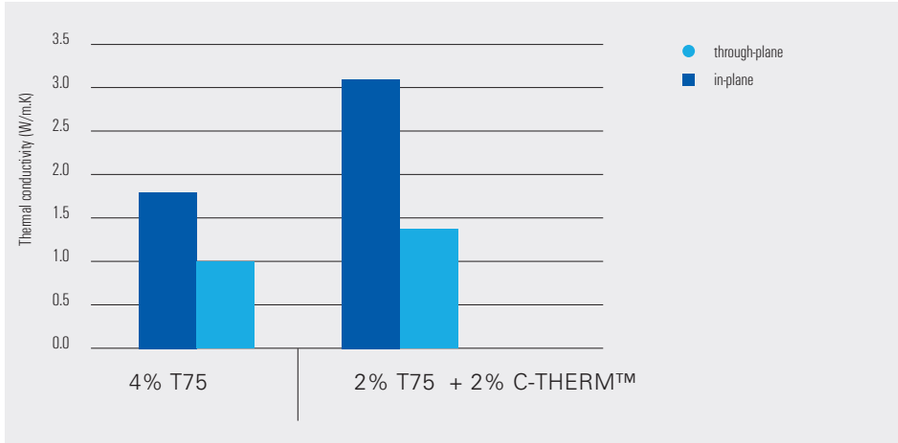


A
10% Cu-alloy
3% T150-600
2.5% natural graphite

B
10% Steel
3% T150-600
2.5% natural graphite

C
10% Steel
3% T150-600
2.5% C-THERM™

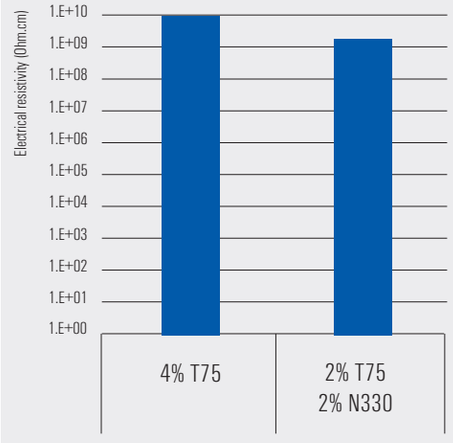
Cu-Free NAO Formulation



CORROSION RESISTANCE

Painting of the brake pads is mandatory in order to increase the corrosion resistance of the metal backing plate. In Cu-free NAO formulations the electrical conductivity of brake pads is strongly reduced which makes electrostatic painting more difficult.
As shown below, even the slightest replacement of % of graphite with C-THERM™ or ENSACO®carbon black can drastically improve the quality of painting thanks to improved electrical conductivity, therfore leading to improved corrosion resistance.
The brake pads have been painted electrostatically using standard industrial equipment. The corrosion test has been performed according to ISO9227 (Courtesy of Raicam), see more details in ref [2]

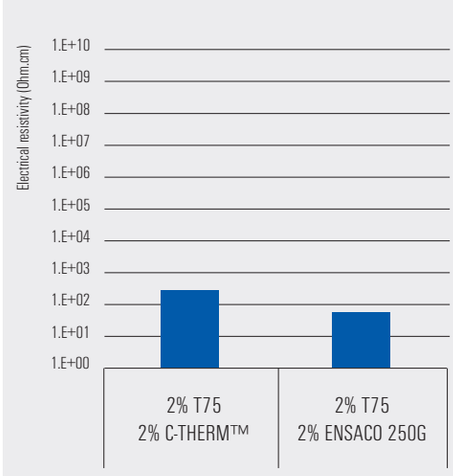
Electrical Resistivity Measurements of Brake Pads



Cu-free NAO formulation with Synthetic Graphite
4% T75

Cu-free NAO formulation with competitor carbon black
2% T75 and 2% N330

C-THERM™ thermally conductive lubricant and ENSACO®conductive carbon black drastically increase the electrical conductivity of brak ore decreasing electrical resistivity.



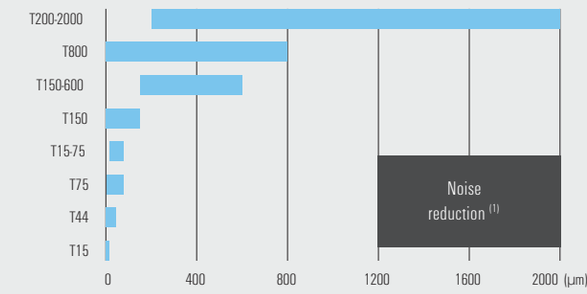
Cu-Free NAO formulation with C-THERM™
2% T75 - 2% C-THERM™

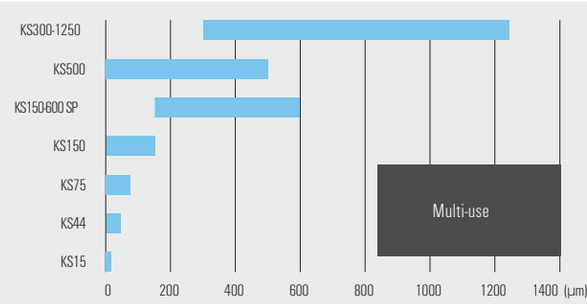
Cu-free NAO formulation with conductive carbon black
2% T75 and 2%ENSACO® 250 G

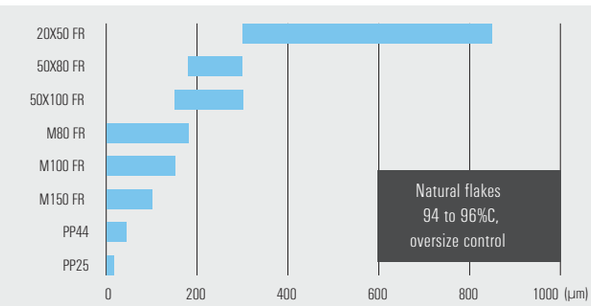
"Courtesy of Raicam"

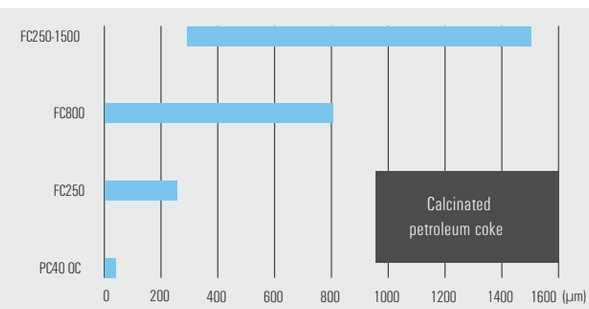
Carbon Solutions for Friction Materials

TAILORED SOLUTIONS









Carbon based solutions for copper-free friction materials:

C-THERM™ 412

- Copper free friction materials [1]
- Hot-spots reduction
- Easy electrostatic painting [2]

Reference:
[1] R. Gilardi et al., Materials 5 (2012) 2258-2269 doi:10.3390/ma5112258
[2] Gilardi, R., Sarocchi, D., and Bounous, L., "Copper-Free NAO Brake Pad Formulation with Improved Electrostatic Paintability Based on Conductive Carbon Powders," SAE Technical Paper 2016-01-1916, 2016, https://doi.org/10.4271/2016-01-1916.

IMERYS
Graphite & Carbon

EUROPE, AFRICA, MIDDLE EAST, INDIA

Imerys Graphite & Carbon Switzerland Ltd.
“Il Centro” Via Cantonale 65, CH-6804 Bironico, Switzerland
Tel: +41 91 873 20 10, Fax: +41 91 873 20 19
graphiteandcarbon.ch@imerys.com

AMERICAS

Imerys Graphite & Carbon Canada Inc.
990 Rue Fernand-Poitras, Terrebonne, QC, J6Y 1V1, Canada
Tel: +1 450 622 91 91, Fax: +1 450 622 86 92
graphiteandcarbon.ca@imerys.com

CHINA

Imerys Graphite & Carbon
1438 Hong Qiao Road, Chang Ning District 6F,
Gubei International Fortune Centre II, CN-201103 Shanghai, China
Tel: + 86 21 2223 0136, Fax: + 86 21 2223 0199
graphiteandcarbon.cn@imerys.com

SOUTH KOREA

Imerys Graphite & Carbon South Korea
7F, Gyodae Venture Tower, 64, Saimdang-ro, Seocho-gu, KR-06640 Seoul, Korea
Tel: +82 234 88 30 30, Fax: +82 234 88 30 79
graphiteandcarbon.kr@imerys.com

JAPAN & SOUTH EAST ASIA

Imerys Graphite & Carbon Japan K.K.
Shinagawa Seaside South Tower 11F, 4-12-1, Higashi Shinagawa, Shinagawa-ku, Tokyo 140-0002 JAPAN
Tel: +81 3 4570 5410
graphiteandcarbon.jp@imerys.com

imerys-graphite-and-carbon.com