MICRONOX®R01 and MICRONOX®R02 as exceptionally effective barrier pigments in the design of anticorrosive coatings for highly corrosive environments

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PROMINDSA RnD Manager

INDEX:

1) Company presentation
2) Corrosion and prevention
3) Micronox R01 and R02: natural pigments with excellent anticorrosion properties

What we are

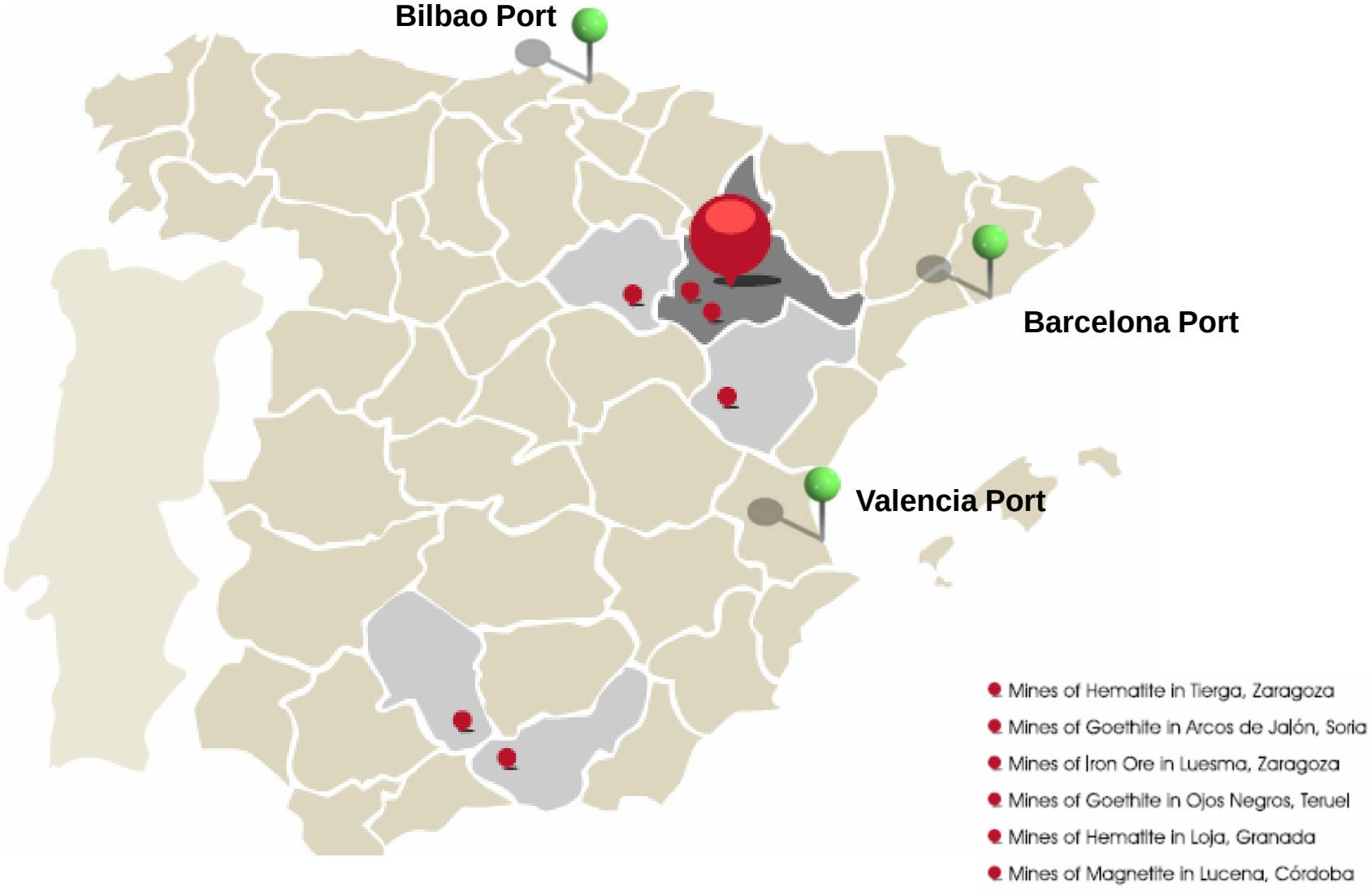
We produce, transform, develop and supply inorganic pigments worldwide.

SINCE 1913

Where we are


Headquarters:
Zaragoza, Spain
promindsa@promindsa.com
Offices/Warehouses:
Athens, Greece
greece@promindsa.com
Offices/Warehouses:
Shanghai, China
china@promindsa.com
Offices/Warehouses:
Lima, Perú
peru@promindsa.com

Our Factory and Mines



MICRONOX® Pigments

- Red Iron Oxide: **Micronox® R**
- Black Iron Oxide: **Micronox® BK**
- Yellow Iron Oxide: **Micronox® Y**
- Brown Iron Oxide: **Micronox® BR**
- Orange Iron Oxide: **Micronox® Marigold**

- **We create and develop customized high quality products**

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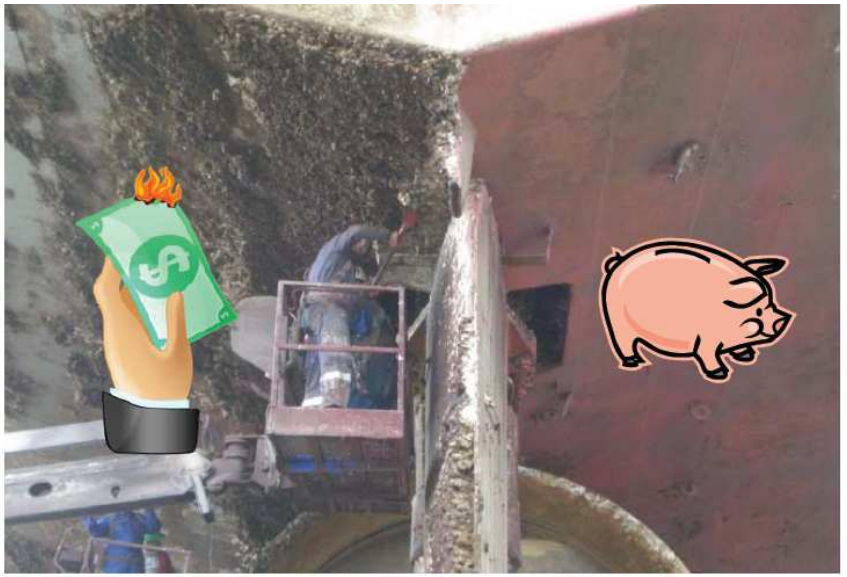
Corrosion-protective coatings

The prevention of corrosion is of paramount importance

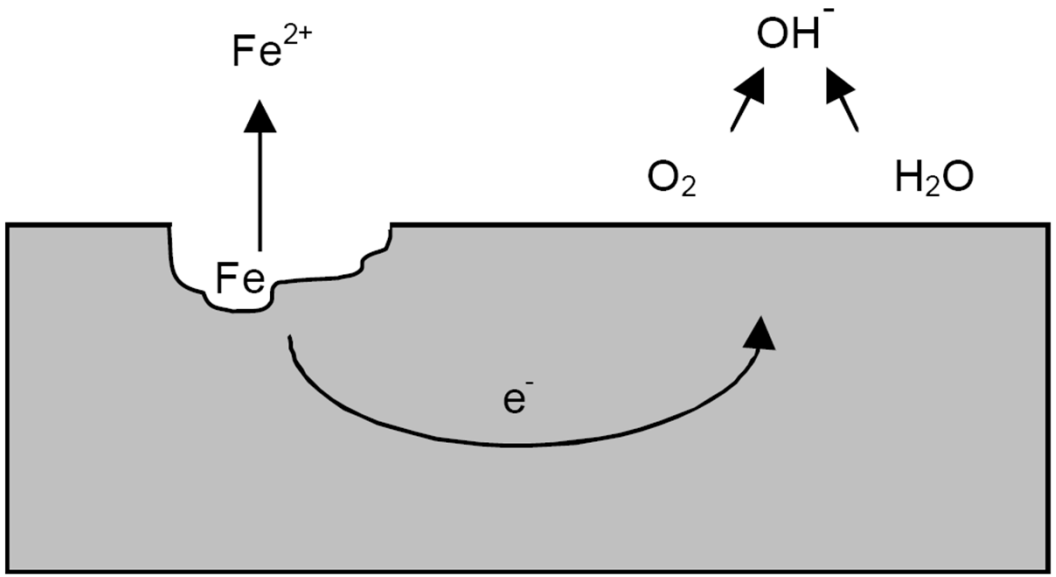
Corrosion causes a lot of **economic damage**.



Corrosion can lead to structural failures

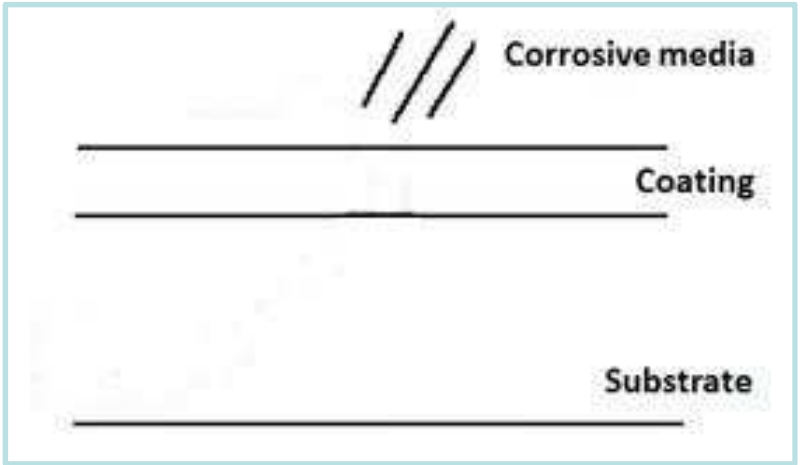
Corrosion-protective coatings

Corrosion is an electrochemical process that destroys the surface of metals

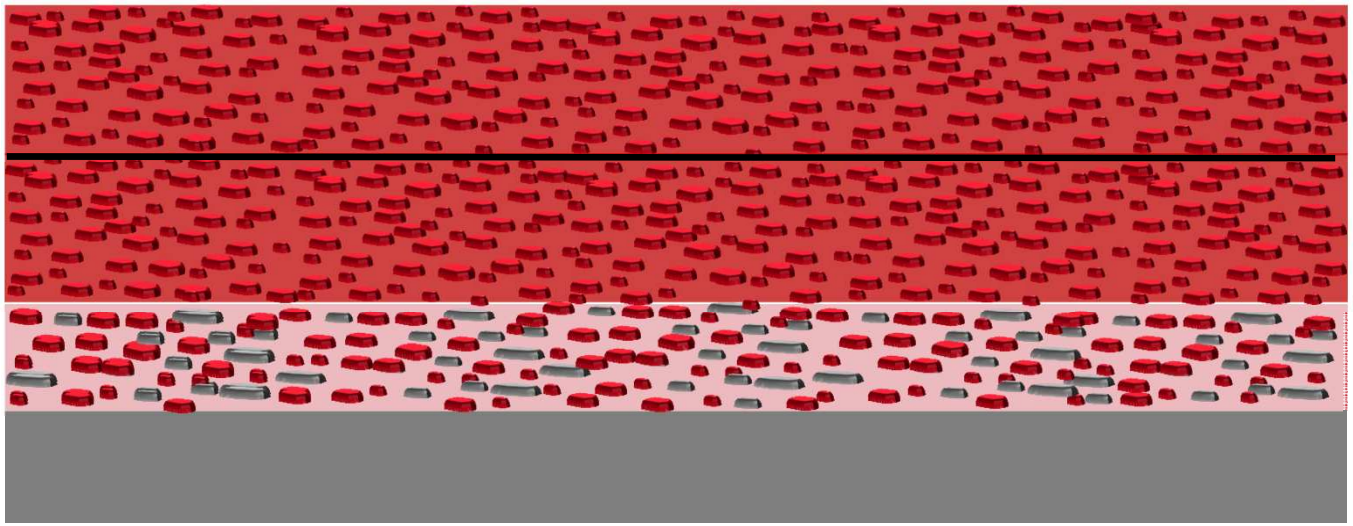


A coating must provide sufficient protection to retard an onset and propagation of corrosion reactions:

- Improve **electrochemical stability** of metal surface (Inhibitive and galvanic effect)
- **Restrict access of corrosive media** to interface (barrier effect)



Anticorrosion coatings



Topcoat
(color and gloss)

Buildcoat
(Build up thickness)

Primer
(anticorrosion and adhesion)

Substrate

Schematic of a typical anticorrosive coating system

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MICRONOX® PIGMENTS

NATURAL MICRONOX®PIGMENTS MANUFACTURING

NOT CHEMICAL PROCESS INVOLVED

NATURAL MICRONOX®PIGMENTS MANUFACTURING

Mineral extraction

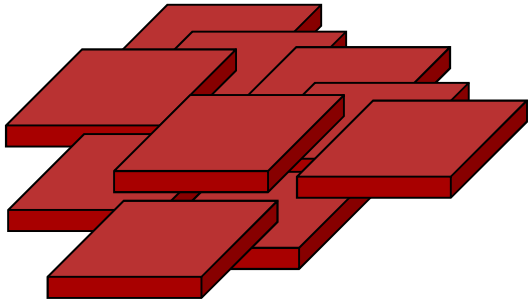
Non-micronized α-Fe_2O_3

Intensive micronisation & clasifying

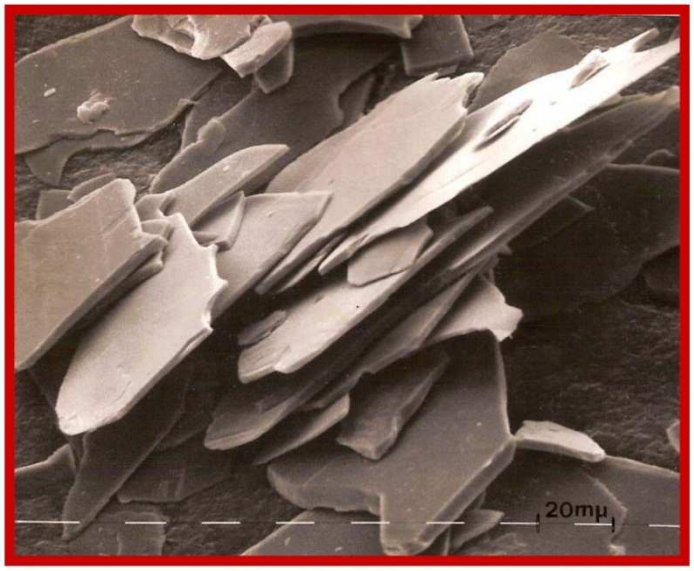
Micronox ®natural red pigment

Lamellar Particle shape

- The **natural** α-Fe_2O_3 (hematites) grows very slowly (millions of years), thus allowing its crystals to develop its pattern (typical morphology), which is **lamellar**



MICRONOX ®
PARTICLE SHAPE



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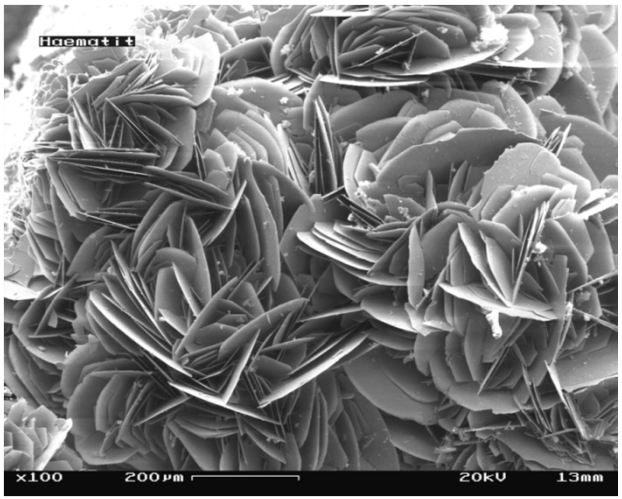
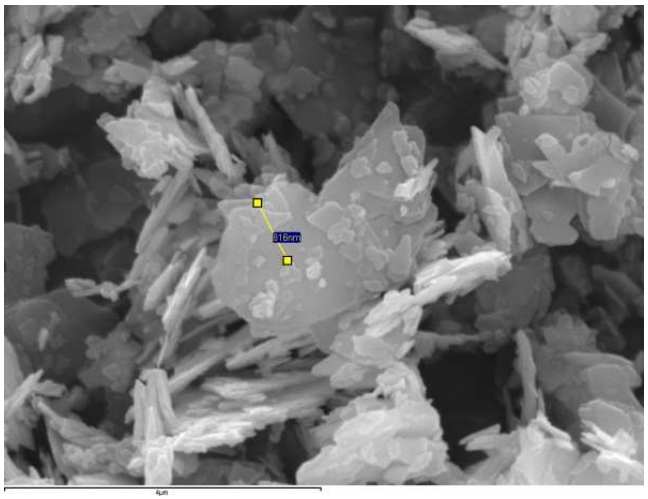
MICRONOX® PIGMENTS

Lamellar shape

Iron ore



Iron ore after milling



Iron ore after micronization

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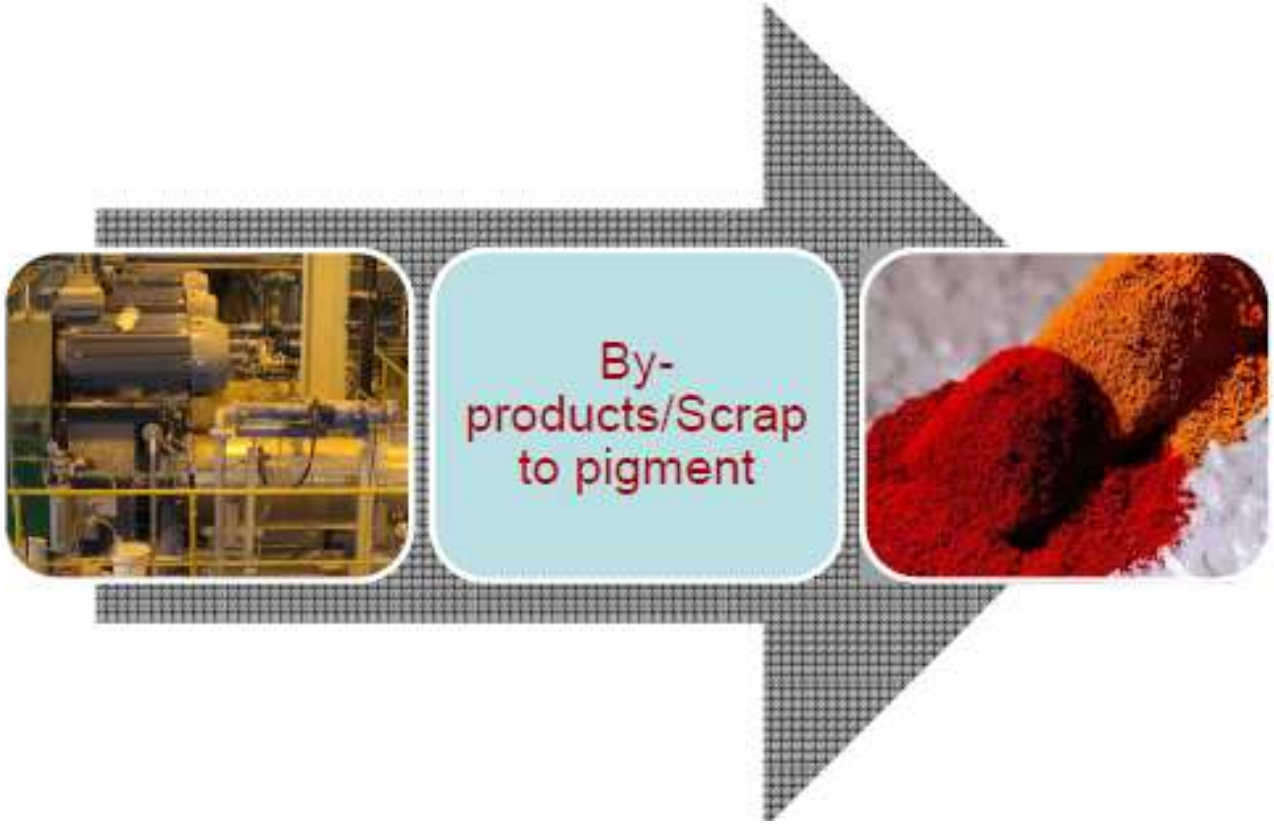
MICRONOX® PIGMENTS

SYNTHETIC PIGMENTS MANUFACTURING

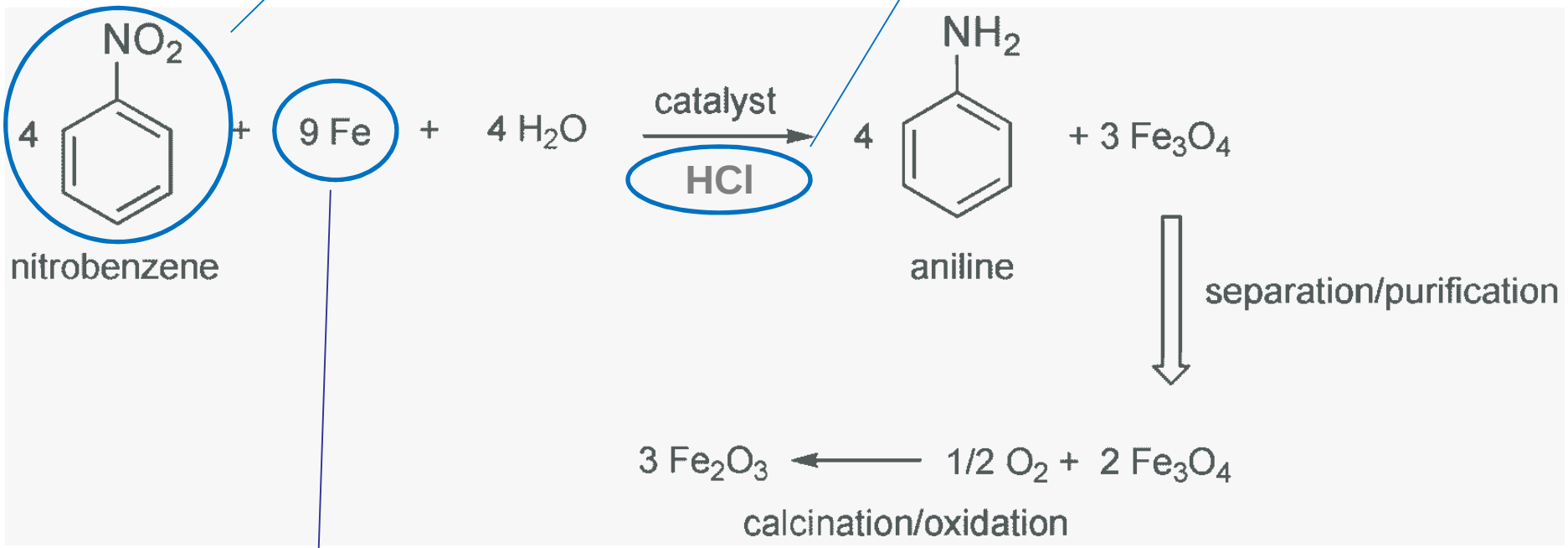


Require the use of **hazardous** and **toxic** substances (Strong acids, heavy metals)

PRODUCTION OF SYNTHETIC IRON OXIDE

Hazardous organic material

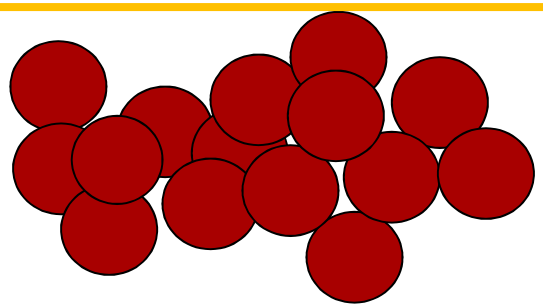
Strong acid



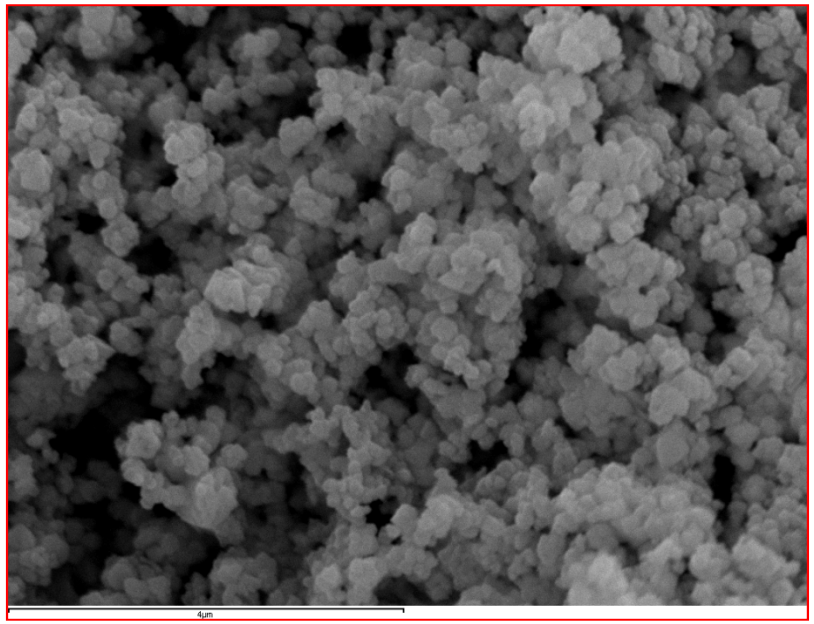
Waste or subproduct of a chemical industry (contains heavy metals, toxic impurities, etc)

Equidimensional Particle shape

- The **synthetic** α-Fe_2O_3 grows very quickly (a few hours), what prevents the crystals to develop its pattern, and gives rise to more **equidimensional** shaped particles.



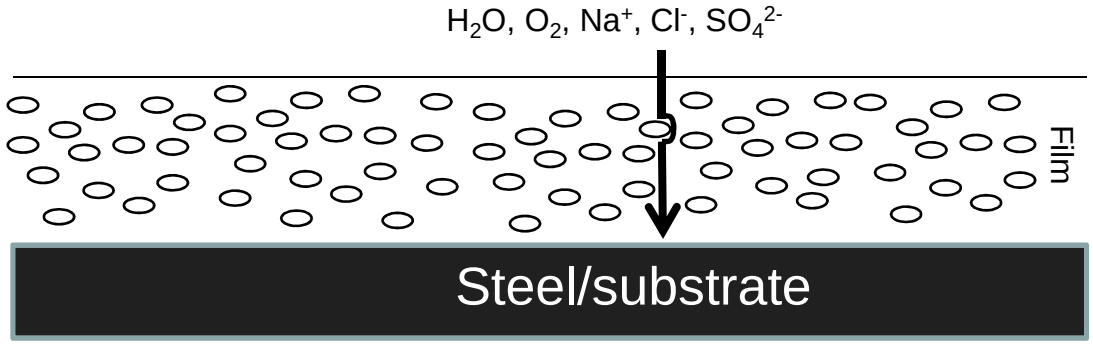
SYNTHETIC PARTICLE SHAPE



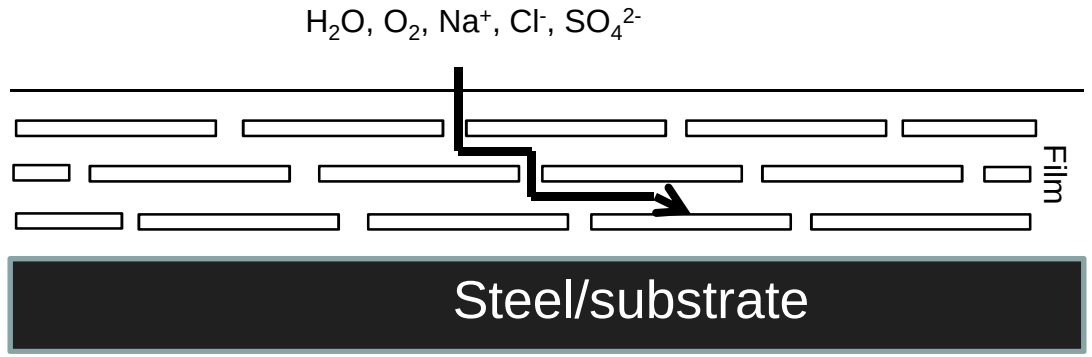
Barrier effect

Primer coating formulated with MICRONOX®R01 and MICRONOX®R02
excellent **barrier-effect**

synthetic



MICRONOX
R01 and R02



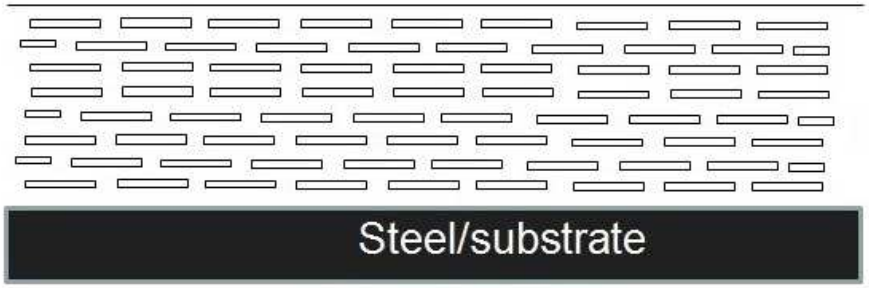
INFLUENCE OF LAMELLARITY

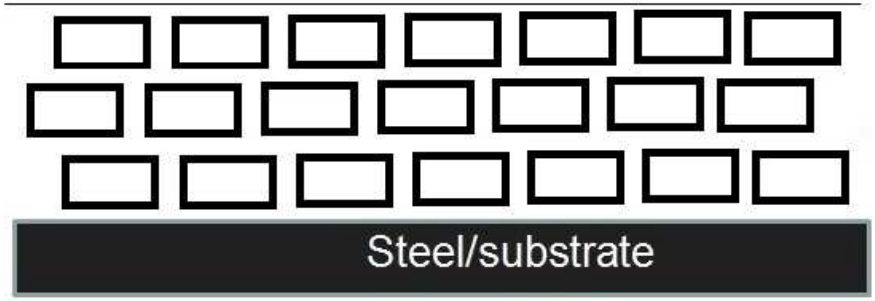
MICRONOX

MIO
(micaceous iron oxide)

Micronox lamellas aspect ratio 1:12

MIO lamellas aspect ratio 1:2



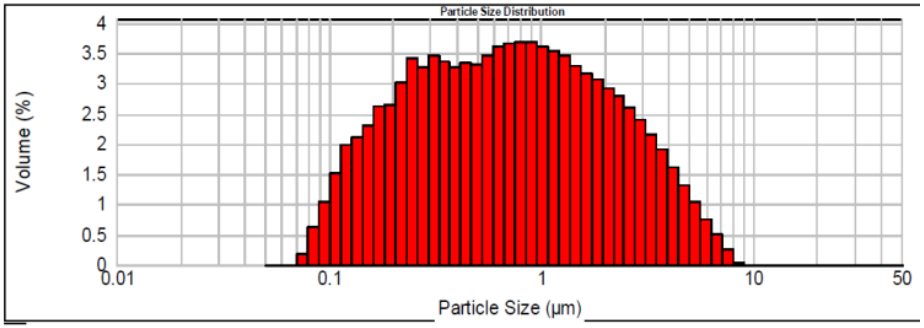


Higher barrier effect

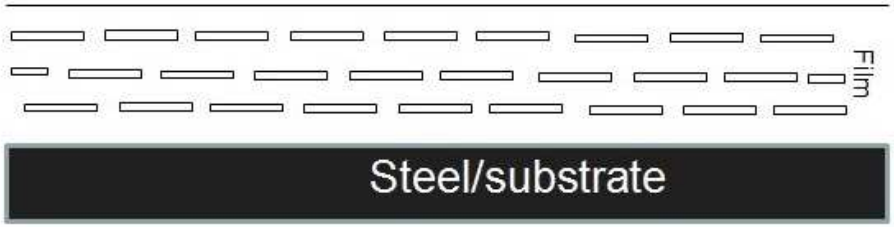
INFLUENCE OF PARTICLE SIZE (NOT ONLY SHAPE)

MICRONOX®R01

High quality of micronization



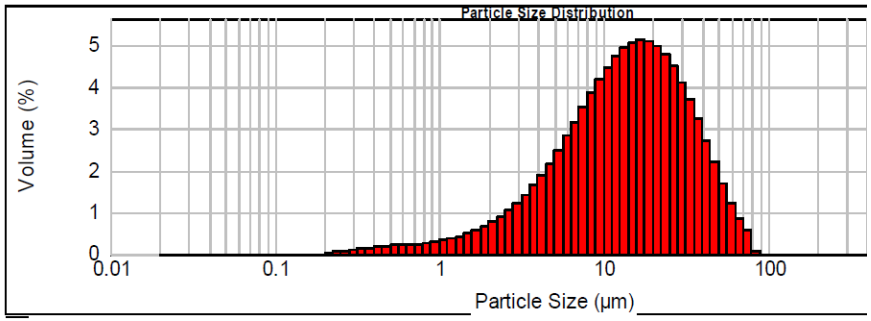
Average particle size: 1.25 µm
Homogoneus distribution of particle sizes



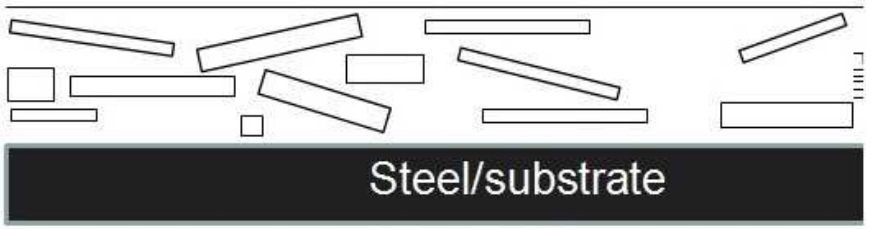
Higher barrier effect

MICACEOUS IRON OXIDE (MIOX)

Low-medium quality of micronization



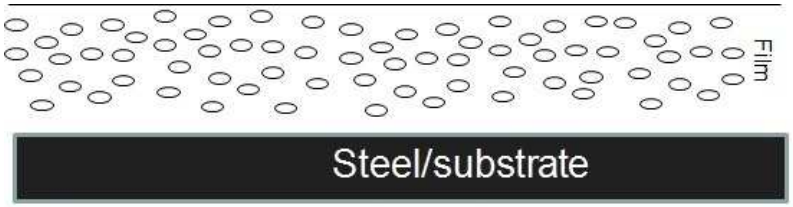
Heterogeneous particle size distribution



Higher permeability

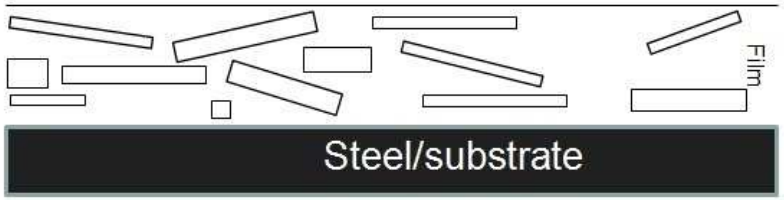
INFLUENCE OF PARTICLE SIZE (NOT ONLY SHAPE)

synthetic

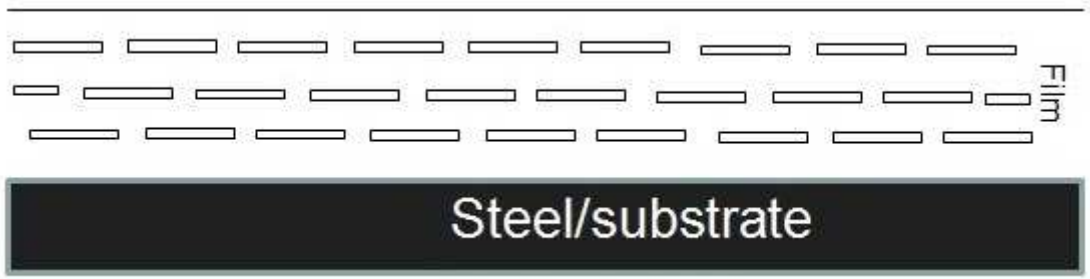


Small particle size-dispersibility

MIOX (natural but low quality of micronization)



Lamellar shape-barrier effect



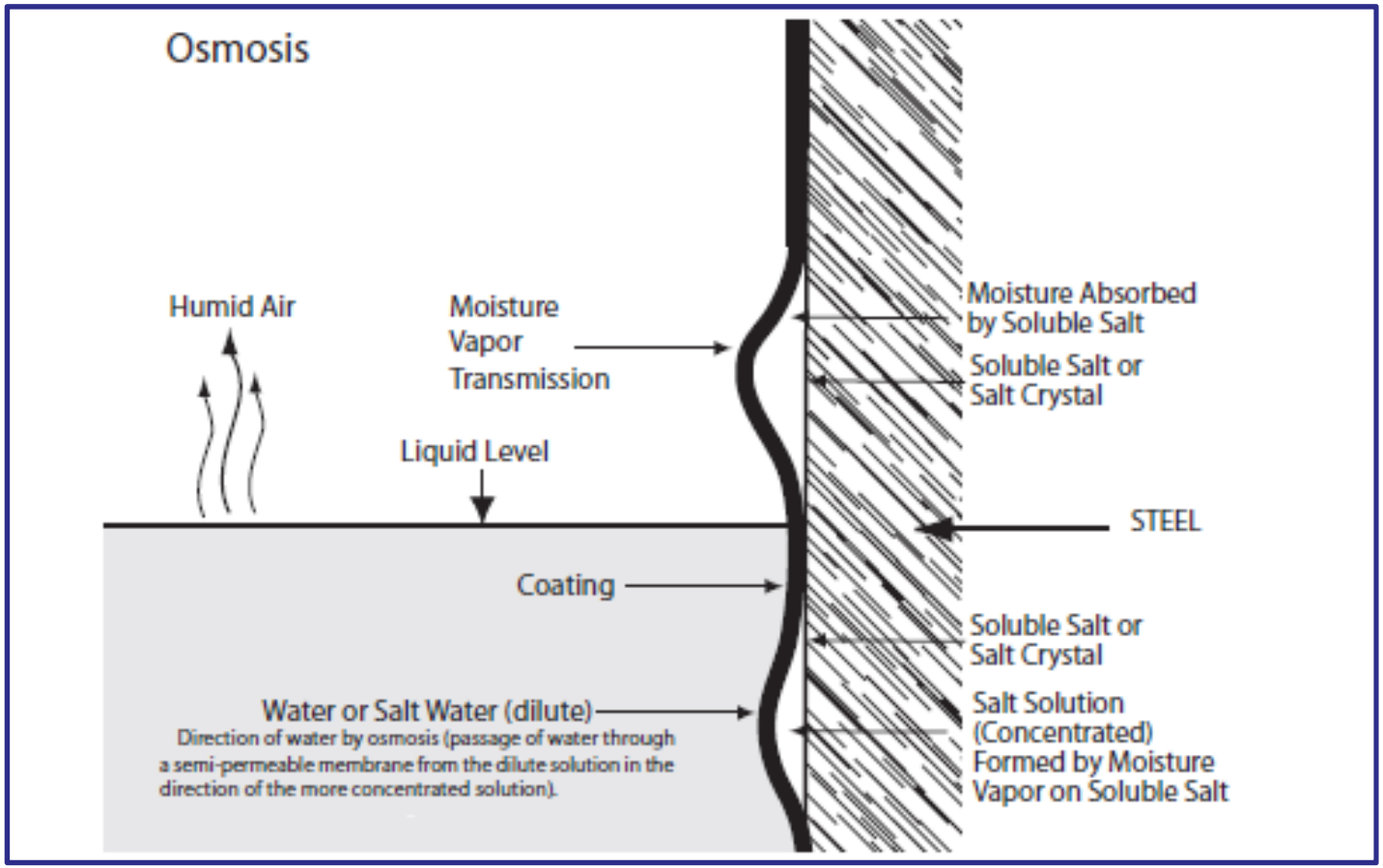
MICRONOX: both small particle size and lamellar shape

EXCELLENT ANTICORROSION PROPERTIES

MINIMIZING BLISTERING

MICRONOX® Red series: content in **water soluble salts** is **undetectable** (< 0.01% wt)
Synthetic pigments: typically content of soluble salts is in the range 1.0 - 0.1 % wt

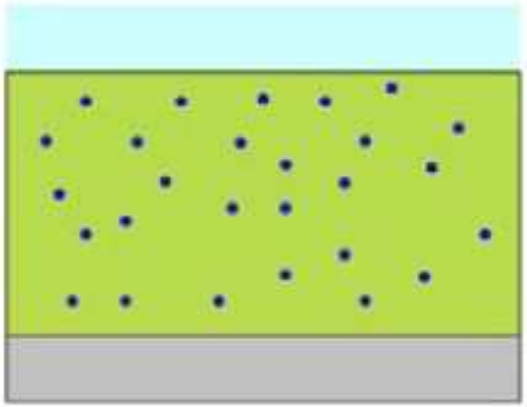
The water uptake produced by **water soluble salts** (typically chloride and sulphate) causes the formation of blisters



Causes and prevention of paint failures, by charles G. Munger. Vol. 1, chapter 23.

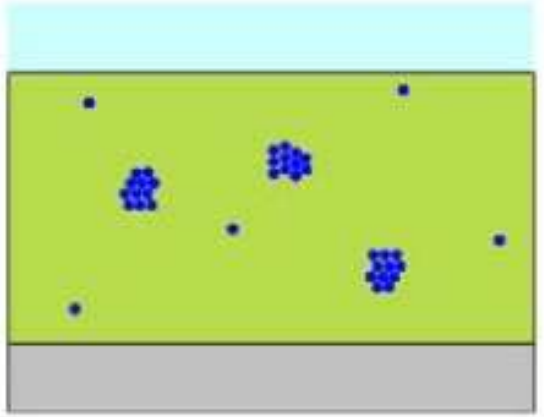
MINIMIZING MICROFOGGING

"microfogging"



molecular dispers distributed water

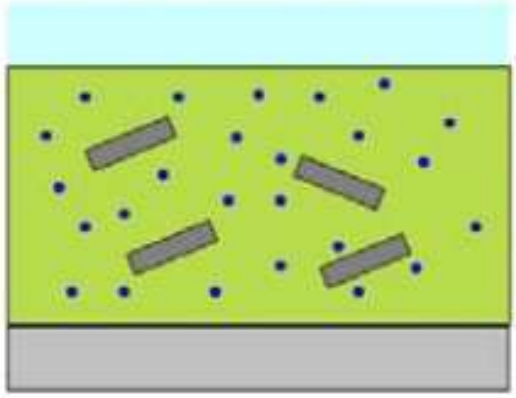
$T_1 > T_2$



excess water, formation of micro caverns

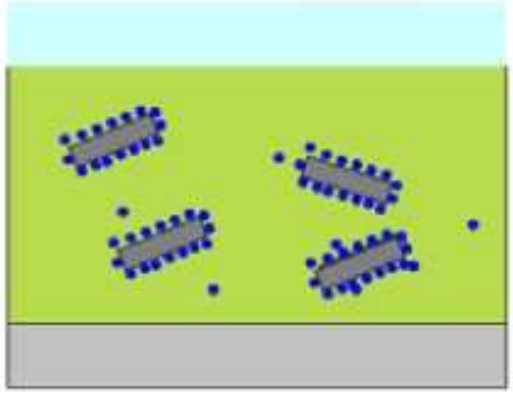
(C.H. Hansen, Prog. Org. Coat. 26 (1995) 113)

durability to temperatur cycling by micaceous iron ore pigments



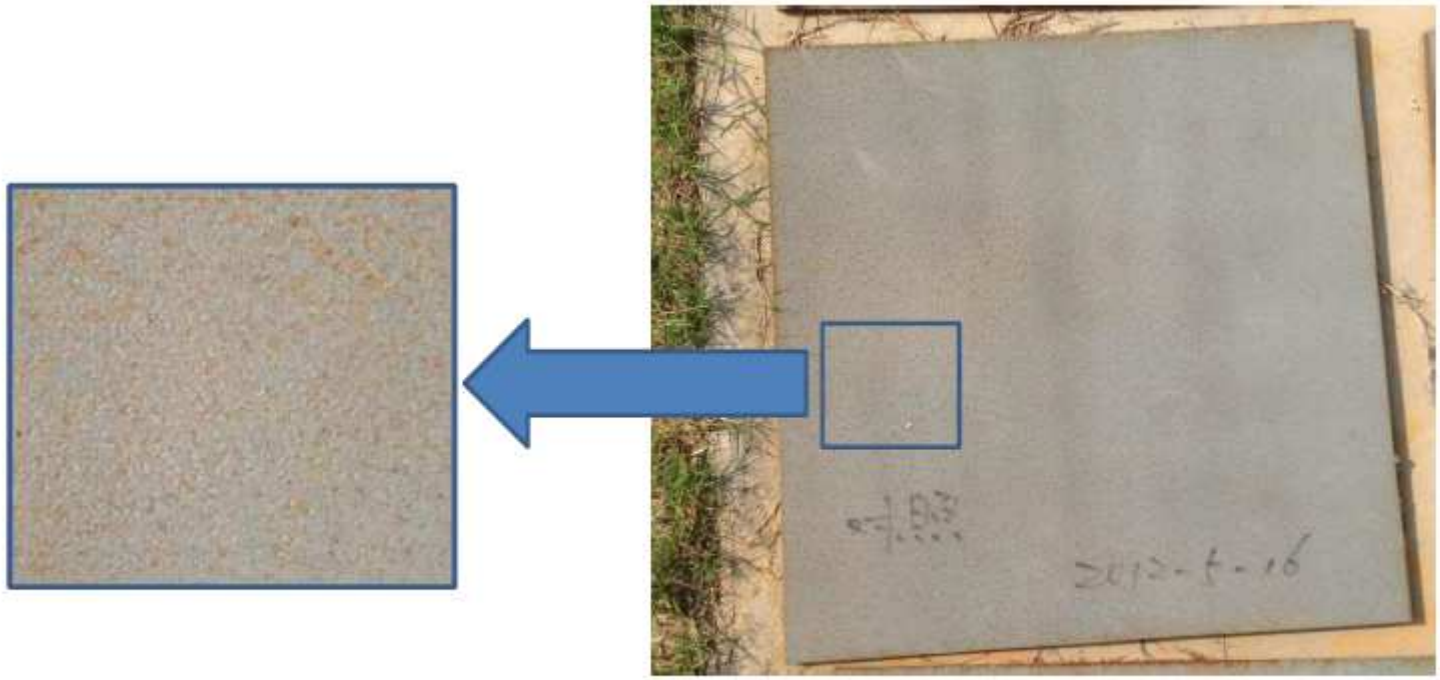
iron ore pigments as condensation nuclei

$T_1 > T_2$

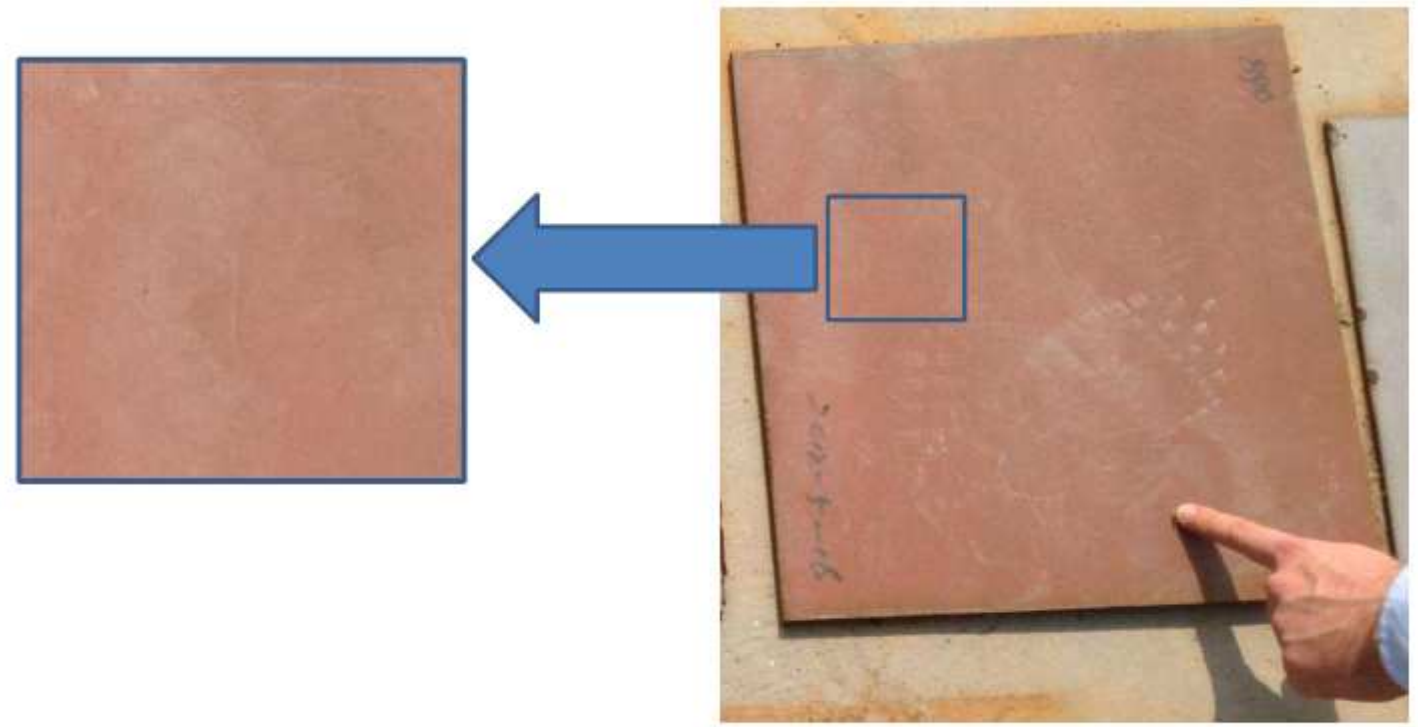


(H. Ochs, J. Vogelsang, Electrochimica Acta, 2004)

Primer with Zn-based inhibitor pigment



Primer with Zn-based inhibitor and MICRONOX®R01 pigment



Synergistic effect

Comparation

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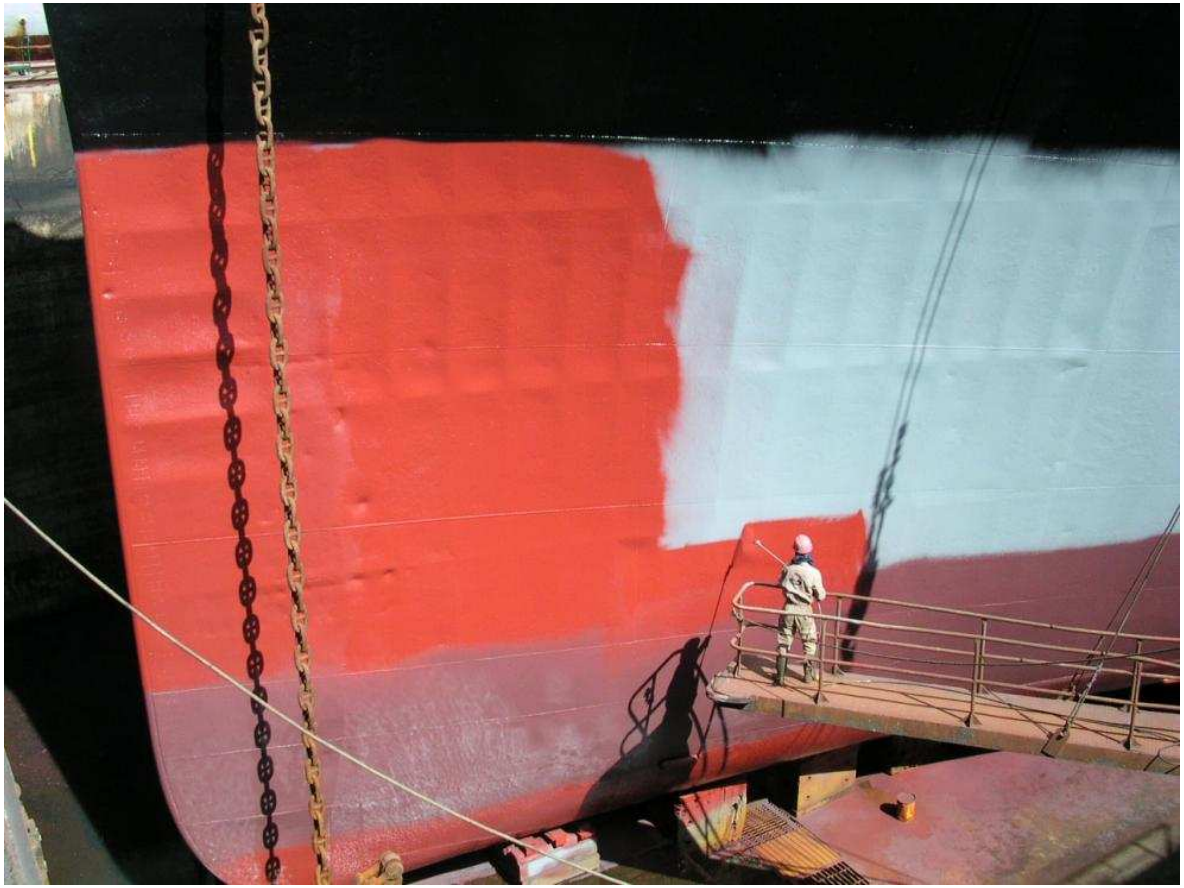
MICRONOX® PIGMENTS

Micronox®R01 and Micronox®R02 are worldwide standard pigments for anticorrosive coatings



Jotun Coatings

спасибо

Thank you

Gracias