BASF
We create chemistry

Chemetall
expect more

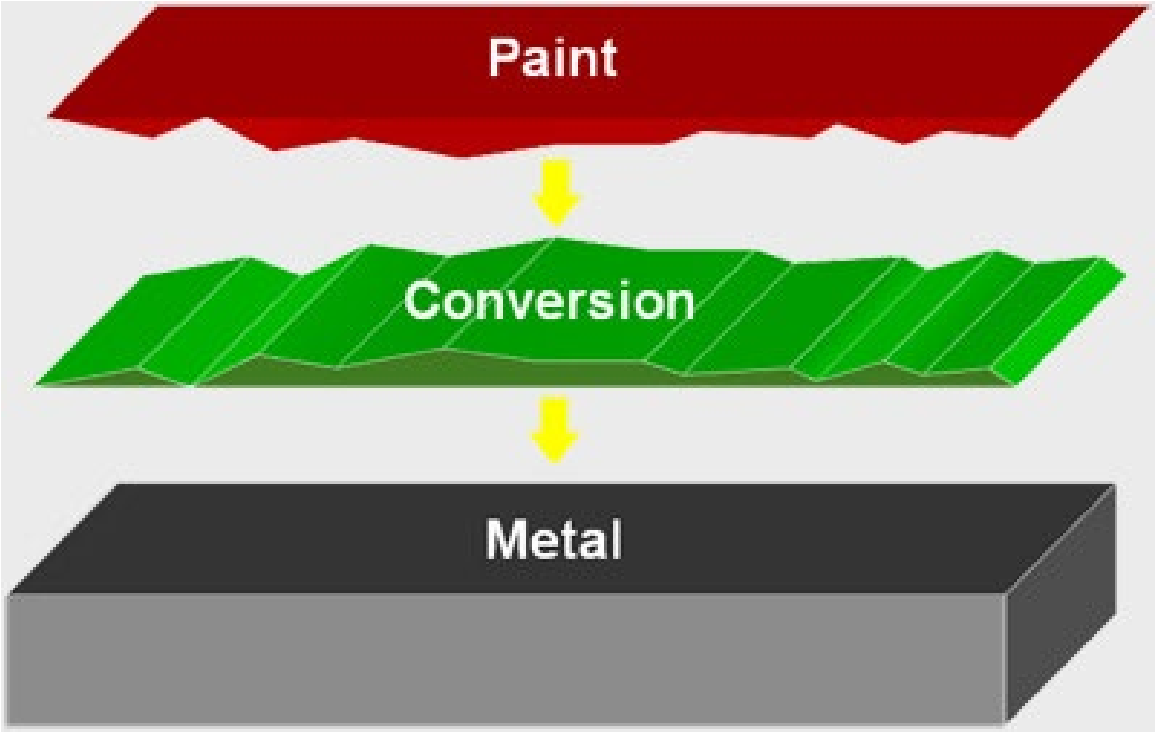
Field Training Series

Iron Phosphate

BASF/Chemetall – Technical Field Support (TFS)

2019-08-09 (rev.0)

Conversion Coatings…



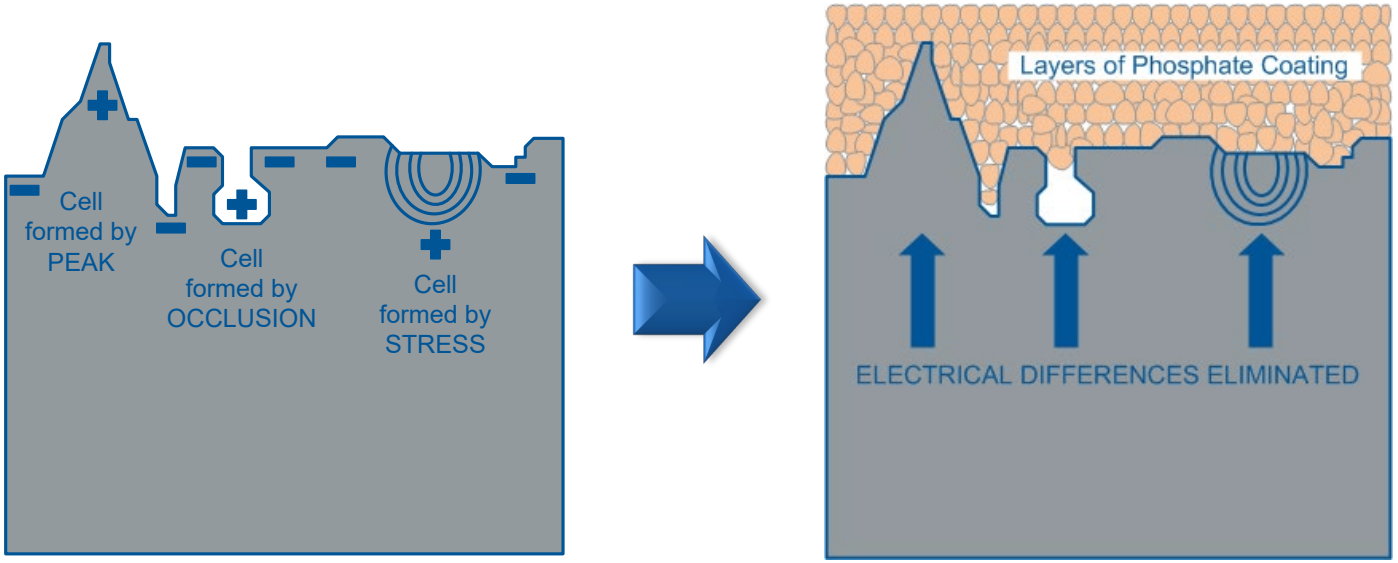
Conversion Coatings…
What is a Conversion Coating?

- Conversion coatings are a complete film which changes the physical and chemical nature of the metal surface
  - Physical – promotes adhesion
  - Chemical – promotes corrosion resistance
- Conversion coatings are adherent, insoluble, inert, crystalline or amorphous surface films
  - The coatings form as a part of the metal surface by means of a chemical reaction between the metal surface and the aqueous acidic solution
  - A portion of the base metal is converted into the resultant coating, which is much less reactive to corrosion than the original metal surface
- Thinner coating typically provide better adhesion
  - Stronger attractive forces between the paint and substrate
- Thicker coating typically provide better corrosion resistance
  - More coating that corrosive elements would have to penetrate
  - Provide better electrical insulation

Conversion Coatings…

How the Coating Works

- The base substrate surface is irregular and electrically conductive, therefore susceptible to corrosion
- The conversion coating imparts an equal potential to the metal surface, neutralizing the local galvanic corrosion sites
- The conversion coating is capable of inhibiting the spread of corrosion creepage under the paint



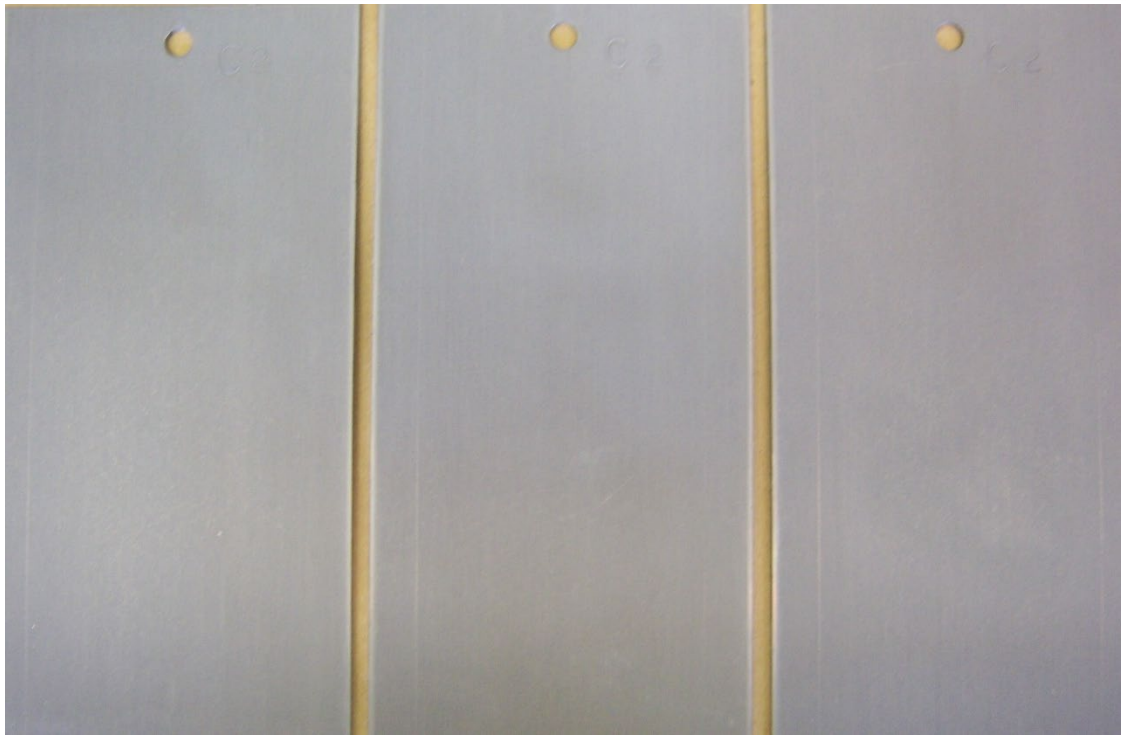
Conversion Coatings…

Conversion Coating Selection Chart

Substrates	Painted Surfaces			Painted or Unpainted Surfaces		
	Iron Phosphate	Zinc Phosphate	Thin Film	Chrome Phosphate	Chrome Chromate	Non-Chrome Coatings
Iron/Steel	✓	✓	✓			
Galvanized	✓*	✓	✓	✓	✓	✓
Aluminum	✓*	✓	✓	✓	✓	✓
Galvanneal	✓*	✓	✓			
Magnesium	✓*	✓	✓	✓	✓	✓

* Iron phosphate provides cleaning only for non-ferrous substrates

Iron Phosphate…



Iron Phosphate…
Why Do We Iron Phosphate?

- Iron phosphate forms a coating on the substrates that:
  - Provides protection from corrosion under the subsequently applied paint film by forming a non-reactive layer that inhibits the spread of corrosion
  - Provides an excellent base for paint adhesion by enhancing the bond between paint and substrate
- A Poor phosphate coating will:
  - Degrade even the best paint system by failing to provide proper adhesion
  - Reduce corrosion protection

"You can make a poor coating perform with excellent pretreatment, but you can't make an excellent coating perform with poor pretreatment"

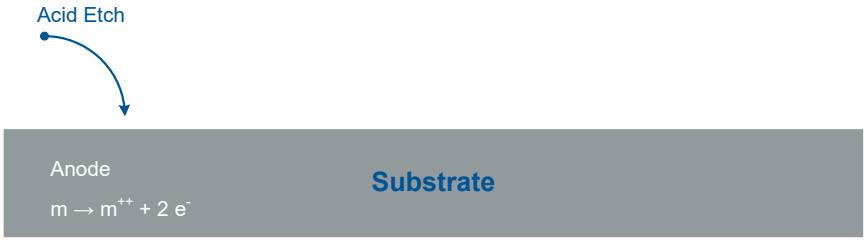
Iron Phosphate…
Basic Information

- Substrates
  - Ferrous substrates
  - Clean-only for aluminum, zinc coated and magnesium substrates
- Application methods
  - Spray
  - Immersion
  - Manual application (spraywand)
- Paint systems
  - All systems (powder, liquid, e-coat)
- Typical uses
  - Indoor products
  - Non-critical outdoor products

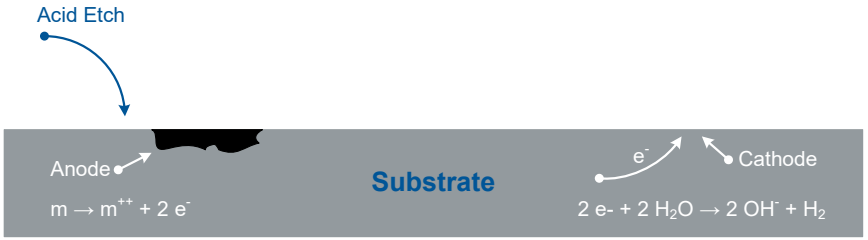
SEM of an amorphous iron phosphate coating

Iron Phosphate…

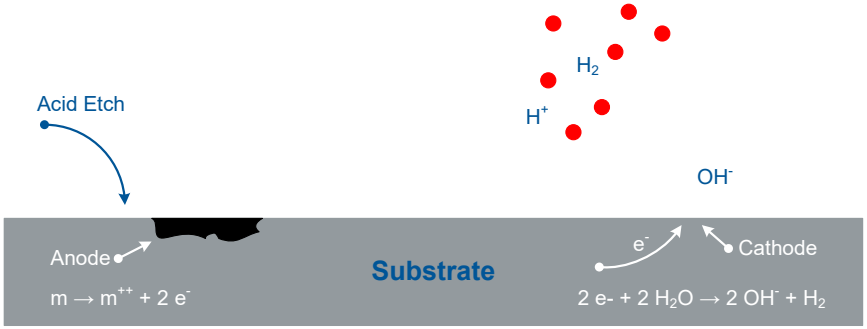
How Does the Coating Form?



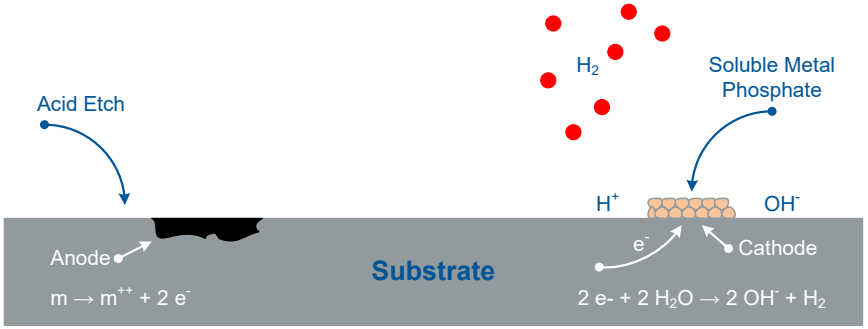
The Free Acid etches the substrate at the anode



The electron shifts to the cathodic site, hydrolyzing water



H+ gas forms and OH-, forming a localized area of high pH

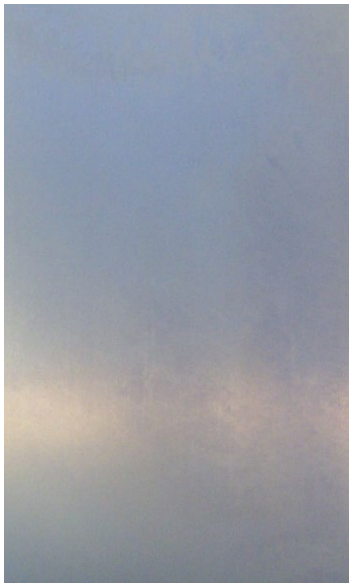


The phosphate coating is deposited on the substrate

Iron Phosphate…
Coating Descriptions

- Coating Weight:
  - Iron Phosphate 30 to 80 mg/ft^2 | 0.32 to 0.86 g/m^2
- Appearance:

Blue, Shiny	→	Blue-Gray, Dull	→	Gray to Gold, Dull
(Light)	→	(Medium)	→	(Heavy)



BASF
We create chemistry

Chemetall
expect more