



What's New in Automotive Paint Technology

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Bureau of Alcohol, Tobacco, Firearms and
Explosives

New Plastic Body Types

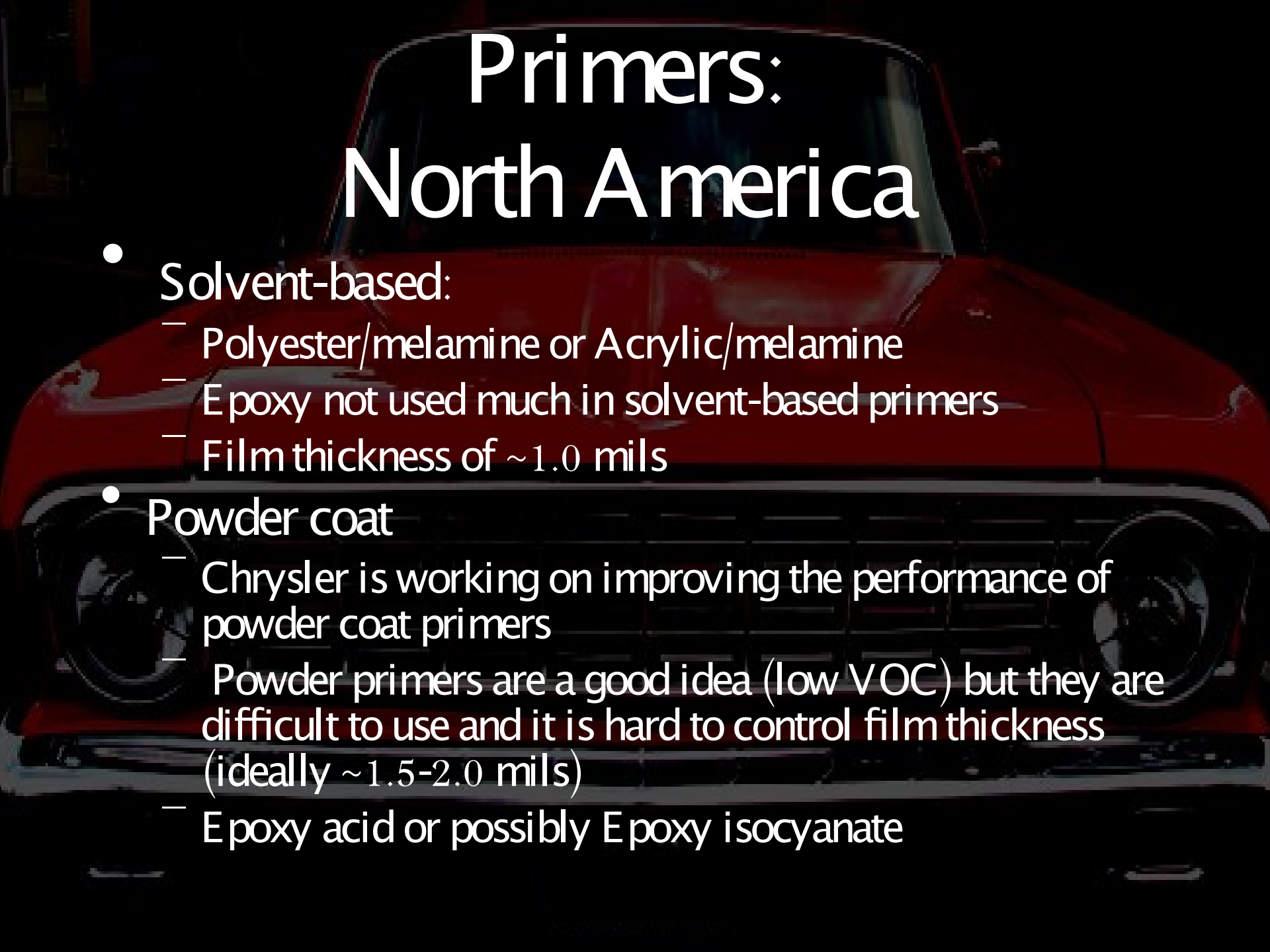
- Most all of the RIM (reaction injection molding, which is urethane) has been replaced with TPO (thermoplastic olefin)
- Rynite (polyester resin) is also used for non-metallic body parts
- Also, nylon and polycarbonates may be used

Coating the Non-Metallic Parts

- Almost all car parts, metal and plastic, are coated with BC/CC
- However, some flexible parts are colored in the mold to match the color of the vehicle

E-Coat Primers

- All metal parts are E-coated on all vehicles
 - E-coat must be chromium and lead-free
- The process of E-coating:
 - metal=>phosphate=>
 - E-coat (1.0-1.2 mils)=>
 - primer surfacer (~1.2mils)=>
 - basecoat (0.4-1.0 mils)=>
 - clearcoat (1.4-2.2 mils)

The background of the slide is a dark, high-contrast photograph of the front of a red car, likely a classic model, showing the hood, grille, and headlights. The text is overlaid on this image.

Primers: North America

- Solvent-based:
 - Polyester/melamine or Acrylic/melamine
 - Epoxy not used much in solvent-based primers
 - Film thickness of ~1.0 mils
- Powder coat
 - Chrysler is working on improving the performance of powder coat primers
 - Powder primers are a good idea (low VOC) but they are difficult to use and it is hard to control film thickness (ideally ~1.5-2.0 mils)
 - Epoxy acid or possibly Epoxy isocyanate

Primers

- Some European manufacturers use waterborne primers
- NOTE: Ford has a new process of a wet on wet on wet (primer on basecoat on clearcoat)
- Some places are using an 'integrated system' which means eliminating either the primer or the basecoat
 - Some make their basecoat more 'primer-like' and some make their primer more 'basecoat-like'
 - Regardless, one paint layer is eliminated

Stone Chip

- Most vehicles have some type of stone chip primer
- A thin film may be applied over the finished paint film unless cladding is used.
 - Plastic cladding is a plastic film that is bolted over the coating (Cadillac SUV's for example)

One component Topcoats

- One component topcoats are not used in North America any more
 - <2% non-US companies are using 1K

Basecoats

- Solvent borne basecoats are mainly polyester/melamine, acrylic/melamine
- Waterborne basecoats are in the form of latex, however, to be more durable some cross-linking resins are added like polyurethane or polyester
 - Waterborne systems are the dominant basecoat system

2K Urethane Clearcoats

- This is popular in Europe and a few Japanese companies use it
- Not used much by North American companies (OEM) because the unions are opposed to it.

1K Clearcoats

- PPG uses an acid epoxy as a crosslinking agent
 - Acid epoxy is:
 - An acid functional group on the acrylic polymer with a low MW epoxy for cross-linking
 - Or an epoxy functional group on the acrylic polymer with a low MW acid for cross-linking
 - The latter is the preferred method
 - This may also be used in some basecoats
- Other crosslinking agents are melamines and carbamates

1K Clearcoats

- DuPont uses a trimethyl silane additive
- There are 2 plants in Europe that have waterborne clearcoats
- One BMW plant has a powder clearcoat (epoxy/acrylic)

Pigments-Aluminum

- Aluminum may have different morphology such as smooth or crinkled so be sure to make note of the aluminum flake appearance
- Manufacturers will coat the flakes with a substance known as a 'passivator'. This will keep the aluminum from reacting with the water (in waterborne basecoats). If the aluminum reacts with the water, H_2 gas forms
- Passivators consist of phosphate, Si, or SiO_2 based materials

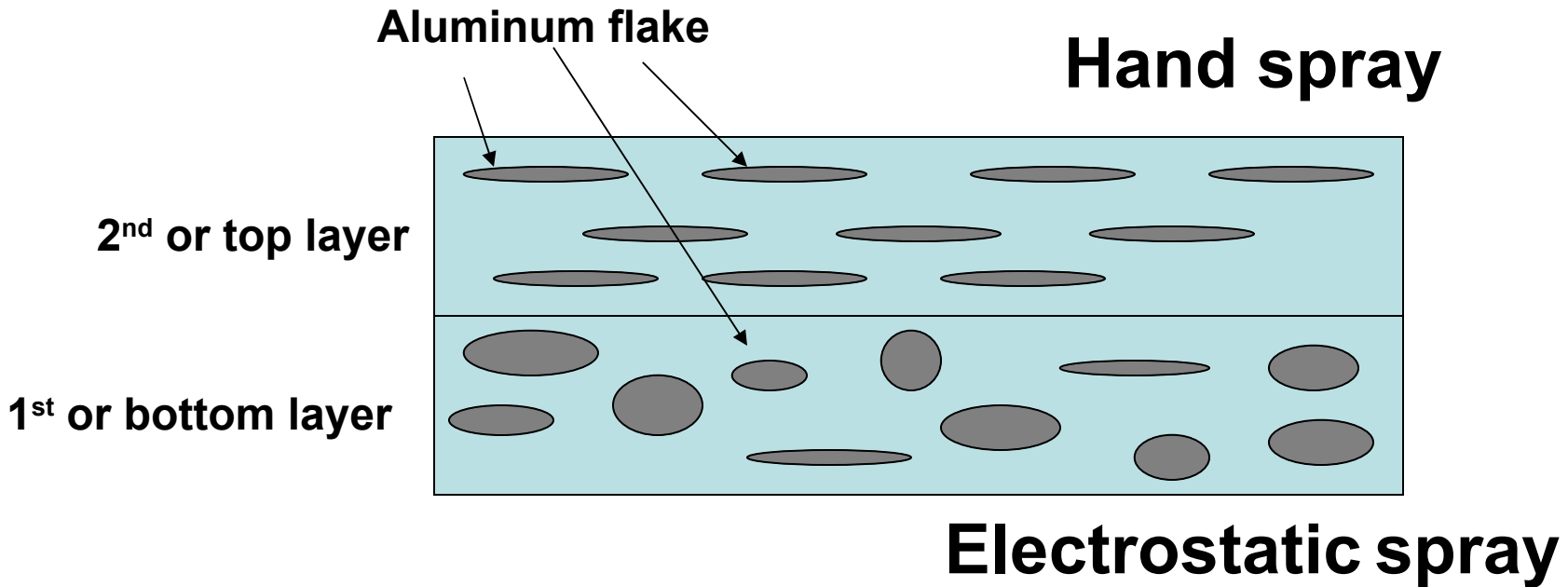
Application

- High volume, low pressure (HVLP) electrostatic spray equipment is used most of the time on most of the parts (has 80% efficiency)
- Hand spraying is used only on touch-ups, hard to reach places (door jams) or interiors

Application Note

- You may be able to tell if a spray job has been a “bell/recipe” (electrostatic spray with a hand spray touch-up). In the bottom basecoat layer the aluminum flake will be oriented in random directions, where as the aluminum flake in the top basecoat layer will be orientated parallel to the surface.

Electrostatic/Hand Spray Paint Cross-section



After-market Paints

- Almost all of the clearcoats are 2K urethane
- Basecoats can be acrylic, CAB (cellulose acetate butyrate)...many of them are waterborne basecoats

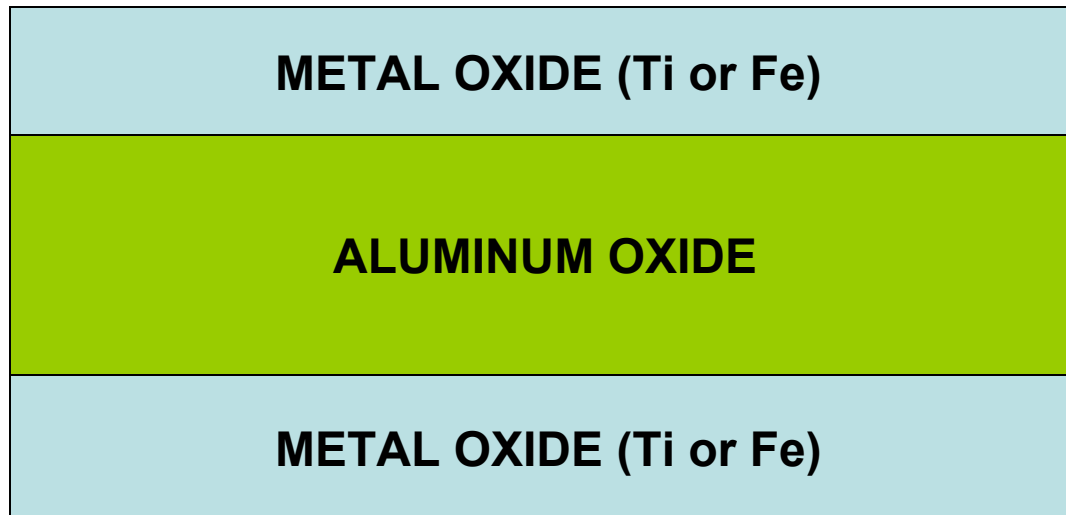
Paint Colors

- Paint colors follow the colors popular in the fashion industry. Since it takes about 2 years to go from inception to factory, the automotive paint color pallet is about 2 years behind the fashion industry
- The Color Marketing Group meet and discuss trends in color
 - This group is made up of people from fashion, interior design, electronics and other industries that consider color an important part of their product

Pigments: X irallic

- X irallic (pronounced ' zirallic') is made along the same lines as the metal oxide coated mica (' pearlescent') pigments
- Instead of mica, the base particle is aluminum oxide synthetically produced for a more uniform particle
- The aluminum oxide is coated with a metal oxide (titanium or iron) to produce interference colors much like the ' pearlescent' pigments
- This pigment is more flashy, less satiny than the mica based pearlescent pigments

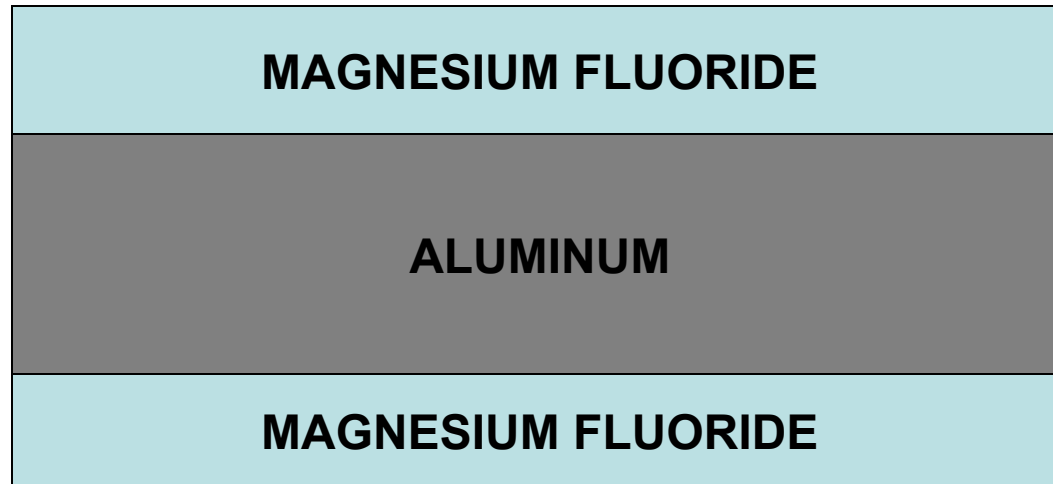
Xirrallic Pigment Cross-Section

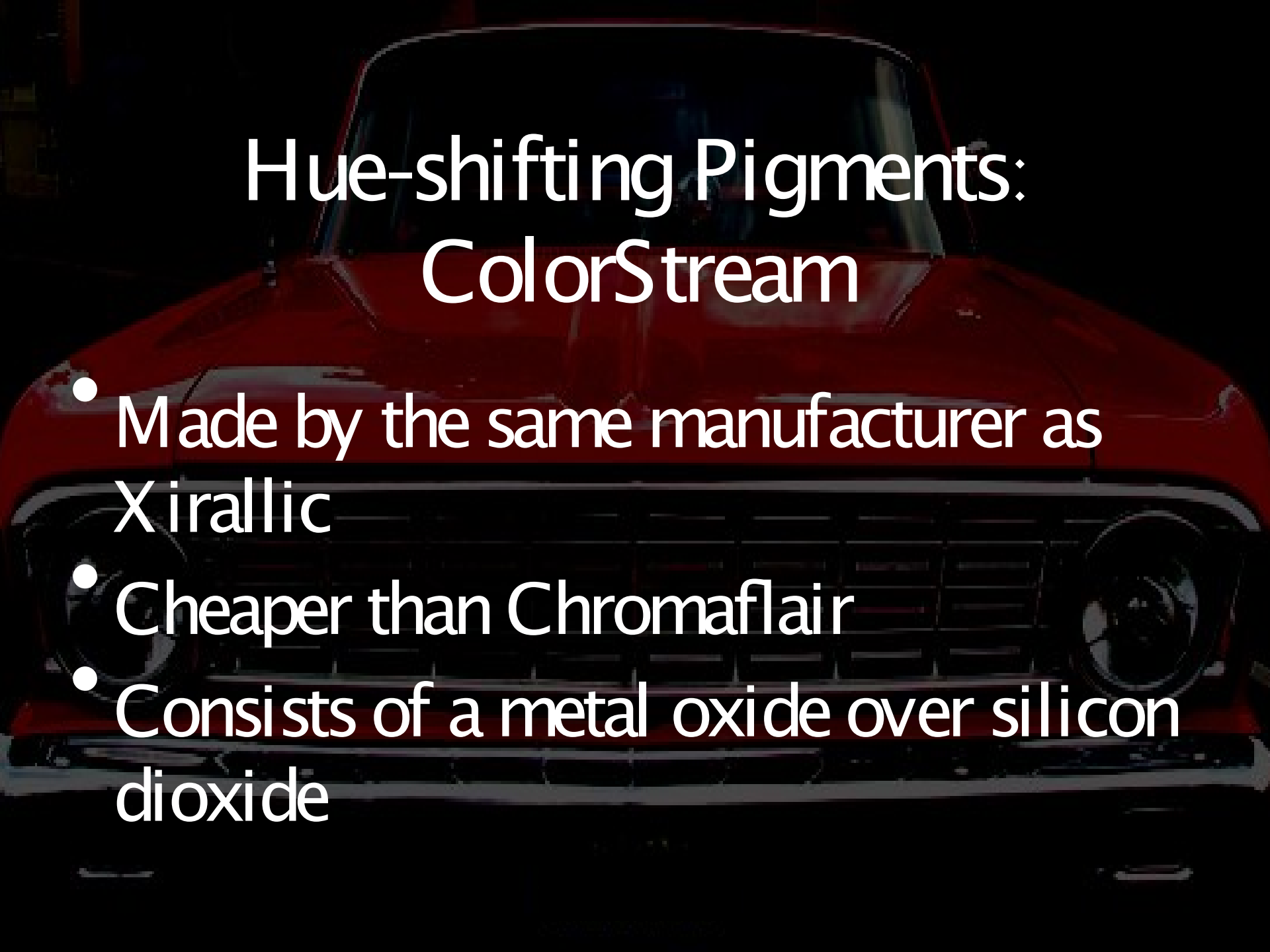


Hue-shifting Pigment: Chromaflair

- Made by Flex Products
- Chromaflair is used in ink in the new paper money
- GM uses it in some silver gray vehicles in low levels (VERY expensive pigment), also used in specialty jobs
- 'Hue shifting': the color changes when viewed at different angles (i.e.: blue to red, purple to green)

Chromaflair Cross-section

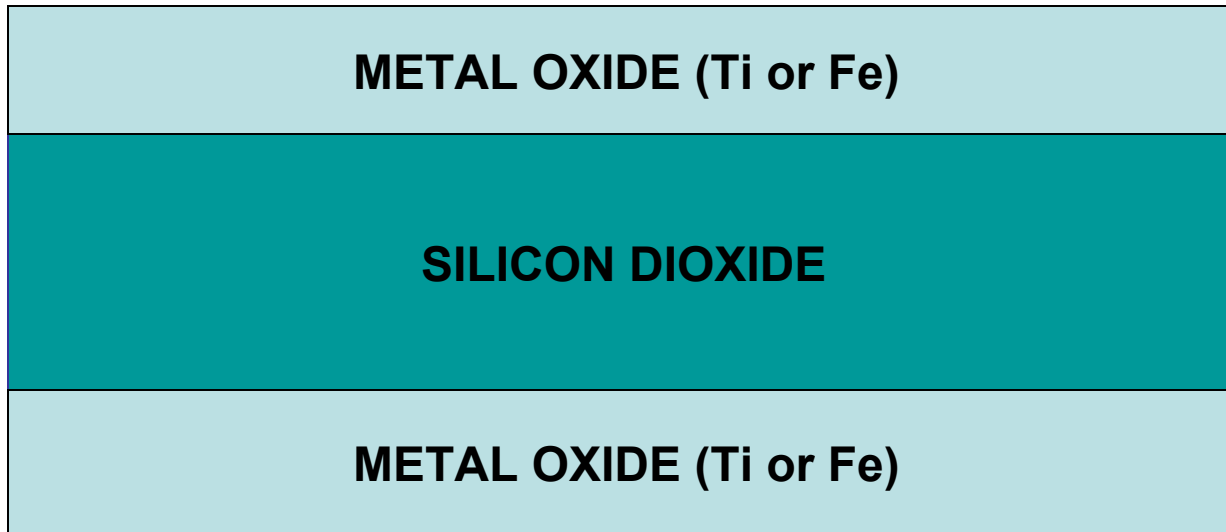




Hue-shifting Pigments: ColorStream

- Made by the same manufacturer as Xirallic
- Cheaper than Chromaflair
- Consists of a metal oxide over silicon dioxide

ColorStream Cross-section



The Future of Automotive Coatings

- Paint technology will continue to be driven by environmental concerns to make coatings with the lowest solvent content (low VOC) higher solids
- Utilizing waterborne technology in more coatings
- Utilizing powder coating technology in more coatings

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