Brought to you by Gema

Ask Joe Powder™

Mg Porosity

Q **Hi Joe,**

I have a cleaner/phosphate that is supposed to treat magnesium, but how should it be handled as far as dry-off and cure temps? I tried a couple of parts this morning with a low gloss clear coat, and they came out looking like Desert Storm camouflage. This was cured for 12 minutes at 180 degrees Celsius.

Bryan B.
Indiana

A Dear Bryan,

Thanks for the question. Magnesium alloys are a tricky substrate to powder coat unless you know how to do it. Most magnesium fabricated products are cast, resulting in a certain degree of porosity on its surface. Cleaning the substrate is a great idea; however, the cleaners/pretreatment can remain harbored in the pores. Indeed, even without cleaning, air resides in the pores. As the powder melts and flows, the cleaners and air escape from the pores. Most powders are curing at this point and can't recover or reseal the holes caused by the volatiles. The result is pinholes, low gloss, and unsightly surface disruptions.

My advice is to continue cleaning as you are but run the parts through a relatively high temperature dry-off before you apply the powder coating. It's preferable to coat the parts very soon after the dry-off, even while they are still warm, so they don't reabsorb ambient moisture. As for dry-off temperature, 200 degrees Celsius (392 degrees Fahrenheit) for 10 minutes is a good place to start.

You should also be aware that many powder suppliers offer product lines that are better suited for porous substrates such as magnesium. It may be best to use one of these with a well-controlled dry-off process.

Good luck.

– Joe Powder

Fun with Math

Q **Dear Joe,**

Is there any method, equation, or software program to calculate powder density?

Thanking you in advance,

Ali B.
Iran

A Dear Ali,

I am aware of two methods used to determine powder density. Both are covered in detail in ASTM D5965 - 02(2007) Standard Test Methods for Specific Gravity of Coating Powders.

One uses the volume displacement of the powder into a fluid (kerosene or hexane) with a known density. The weight of the powder is known so the relationship between weight and volume can then be calculated.

$$\text{Powder Specific Gravity} = \frac{\text{Weight of Powder (grams)}}{\text{Final Volume - Original Volume (milliliters)}}$$

This method involves introducing the fluid into a graduated cylinder. The volume and weight of the fluid is recorded. Next, a given weight of powder is mixed into the fluid and the displaced volume is determined. It is essential that you eliminate all air pockets in the mixture to obtain a reasonably accurate measurement. Please be aware that this method doesn't easily account for the surface porosity common with most powder coatings and typically results in a lower than true specific gravity. Nonetheless, it can be used as a decent tool to compare powders.

A much more accurate method is based on the Ideal Gas Law and utilizes a gas pycnometer instrument which measures volume of a known weight of powder by gas displacement. These are relatively expensive instruments and are available from a number of commercial instrument suppliers. Each instrument is slightly different; some measure volume, others can measure volume and density. You would have to consult the specific procedure provided by the

instrument manufacturer to successfully measure specific gravity of powders.

I recommend you use the simpler fluid method but always run a control sample of known specific gravity along with your samples to be evaluated.

I hope this helps.

Best regards,

– Joe Powder

A Recoating Wrinkle

Q **Dear Joe,**

We currently use a "midnight black" wrinkle powder coating supplied by a major powder producer. Can a second touch-up coat be applied after the first coat has cured? The first coat is being applied over cleaned HRPO (hot-rolled, pickled, and oiled) steel. The second touchup coat does not adhere to the first coat and flakes off easily. Any comments, suggestions?

Regards,

Loyd F.
Texas

A Dear Loyd,

Recoating wrinkle finishes can be a headache. This product is epoxy-based, which makes the task even more difficult as epoxies cure "hard" and are less receptive to recoating. Your best option is to scuff sand the entire surface to be recoated, blow it off, then solvent wipe with acetone or MEK. This may provide the adhesion you need.

Using a polyester-based wrinkle is another option. These are not as hard as the epoxy wrinkle, which should make recoating somewhat easier. However, the polyester wrinkles are more sensitive to substrate surface defects and pretreatment streaking. HRPO steel can sometimes exhibit imperfections that will probably interfere with the development of a polyester wrinkle finish.

Therefore, I would first try the scuff sanding followed by solvent wiping. If this doesn't work, you may be relegated to stripping the defective parts, cleaning them, and powder coating a virgin surface.

Good luck with sorting this out. Let me know how things progress.

Best regards,

– Joe Powder

Joe Powder™ *is trademarked and owned by Kevin Biller, technical editor for* Powder Coated Tough. *Please send your questions and comments to* Joe Powder™ *at askjoepowder@yahoo.com or visit askjoepowder.com to listen to their "powdcast."*

Editor's Note: Letters to and responses from Joe Powder have been edited for space and style.