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**Ask Joe Powder™**

## Shelf Life

**Q** Hi Joe:

I'm selling powder coating in South America. So, I have many questions in regard to powder coatings. But the most important is this: How long can a powder coating be used after its expiration date, when kept at the recommended storage conditions?

Thanks,

Claudia H.  
Medellin, Colombia

**A** Hello Claudia,

The stability of a powder coating is influenced by many factors. First, I must differentiate two distinct types of stability. Physical stability involves the requirement for the individual particles to resist clumping or sticking together. Chemical stability refers to a powder coating's resistance to premature polymerization during storage and handling.

Physical stability is influenced by the melt point or, more specifically, the T<sub>g</sub> (glass transition temperature) of the powder coating and the storage conditions. A powder coating with a low melt point will sinter and clump more readily than one with a higher melt point. Accordingly, powders stored in high temperature environments will clump more readily than those stored in cooler areas. In addition, powders exposed to high humidity environments tend to absorb moisture, which will also cause clumping. (Please note that most powders are supplied in moisture impervious containers and the exposure to moisture occurs after the package has been opened.) Clumping obviously

makes a powder difficult to fluidize, transport, and spray in an application system.

On the other hand, chemical instability causes a powder coating to chemically advance or polymerize during storage. Fast reacting and low-temperature curing powders can start to polymerize in high-temperature storage conditions. This premature chemical advancement reduces the melt flow of a powder coating, causing a more textured finish.

Both physical and chemical instability can be present in a powder coating. Typically, fast-cure (or low-temperature cure) powders also have low melt points to help facilitate better melt flow at low cure temperatures. Consequently, these types of powders are most susceptible to clumping and chemical advancement and should be stored and applied in a climate-controlled environment. I recommend less than 27 degrees Celsius and 50 to 70 percent relative humidity.

Now to answer your question (are you asleep yet?). Standard curing powder coatings (175-200 degrees Celsius) that have been stored in a reasonable environment can remain usable long past their expiration date. Low-cure powders and those that have been stored in environments exceeding 27 degrees Celsius for long periods of time can suffer from clumping and chemical advancement. I would inspect (for clumps, etc.) then spray and bake a sample of any powder that is past its expiration date and make the determination yourself. If the finish is still within your requirement for smoothness and appearance (no blistering, dirt, etc.) then I would continue to use it.

Claudia, I hope that this helps you. Someday I hope to return to Colombia to enjoy the beautiful weather, excellent food, and wonderful people.

Peace,

- Joe Powder

## Weather Whiplash

**Q** Dear Sir,

I've read with great interest your two articles that appeared in previous issues of *Powder Coated Tough* online, "PC Summitry: Polyester vs. Polyurethane" (Mar/Apr 2013) and "Technology Interchange: Choosing an Outdoor Durable Powder Coating" (Sept/Oct 2016). Presently, I am deciding on which powder coating treatment to use on a mild steel

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exterior fence and railing currently being built for me that will enclose a raised concrete porch on the north side of my home. I live in Wichita, KS, and as you can well imagine, we get all kinds of weather here, including sub-zero temperatures and hundred-plus days in the hot baking sun, icy and snowy winters, sheets of driving rain, and drought-like conditions in the warmer months. The weather here will challenge any surface treatment.

In the first article mentioned above, you said that “superdurable polymers are available in both polyester and polyurethane varieties.” Ten swatches by three different powder suppliers have been provided to me, among which I am partial to a textured polyurethane matte finish. I like how smooth it feels yet slightly textured, its color mottled rather than single-toned, the finish vaguely glossy but generally subdued. In short, I really like how it looks and feels. But, from what I can tell, the black texture matte is an AAMA 2603 finish and, quite frankly, I’m worried that it won’t last very long in my setting. So, my question is, which powder coating companies also formulate their polyurethane finishes using superdurable polymers?

Powder coating is a new topic for me, and I’m not getting much guidance locally. Any response you can give me will be greatly appreciated.

Sincerely,

Robert K.  
Wichita, KS

**A** Hi Robert,

Thanks for your questions. You are wise to ask them before rather than after the project is completed. Yep, Wichita and really most of the Midwest “enjoys” significant swings in climate. We’re based in Columbus and experience similar swings. You should definitely specify a “superdurable” powder coating that meets AAMA 2604 requirements. Polyurethanes are tougher and more scratch and corrosion resistant than polyesters (superdurable or otherwise). Unfortunately, they are not too common as they carry a cost premium. I did a little research and found a superdurable gloss black polyurethane. I will send you a link privately.

I also found an automotive-grade matte black that is based on a superdurable polyurethane. I’m sending you a link for that one as well. This one meets automotive specs that exceed AAMA 2604 requirements and will work with the proper metal preparation. This entails perfectly clean mild steel followed by a 5-stage iron phosphate pretreatment. A zirconium-based pretreatment will work as well if it’s well-engineered and in specification. If you really want a belt and suspenders approach, an epoxy-based primer would make the finish bullet-proof. And that’s what I would

go with. I would inspect the powder shop before committing to the job. Tell them Joe Powder sent you.

Please let me know if you need anything else and good luck.

Sincerely,

– Joe Powder

## It’s Dielectric Constant, K?

**Q**

Hi Joe,

One customer mentioned back ionization problems when blending a fluoropolymer with an acrylic resin. Can you teach me what back ionization is?

Thank you.

Hongli W.  
Exton, PA

**A**

Hi Hongli,

Back ionization occurs when excess charge builds up on a powder coating layer. It usually is associated with a poor ground or applying powder to a semi-insulated surface. The insulation can be due to a previous coat on the surface, like a primer. It also occurs when someone tries to pile on too thick a coat too quickly and the charge doesn’t have time to dissipate to the ground.

That said, different powders attract and dissipate charge differently. It probably has to do with the dielectric constant (K) of the resins and the influence of pigments, inert fillers and additives.

Sincerely,

– 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](mailto:askjoepowder@yahoo.com).

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

### Not Your Average Joe...

Each issue, we take the padlock off the PCI® Test-Lab door for a few minutes so our favorite technical editor and “powder guru” Joe Powder can run in the yard. When he’s not gnawing on a rawhide bone, he loves to answer readers’ questions. Go ahead and send him one at [askjoepowder@yahoo.com](mailto:askjoepowder@yahoo.com)... he doesn’t bite. Maybe it’ll end up in the next issue!