# Preparing ABS Parts for Coating or Plating

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Many users of 3D printers have found that, by coating or plating ABS models, they can use the actual model for display and other purposes where production parts would not be feasible. This process is becoming very popular for automotive mock-up applications, such as concept vehicles for shows. Preparing parts to be plated or metalised is very similar to preparing them for painting, and the following finishing procedure should be followed for both processes.

The first and most important step to take is to prime and smooth the models. A good acrylic-based automotive primer, such as Kondar DZ3 Acrylic Primer Surfacer by PPG Industries, should be used in its original, thick form to fill in gaps and "stepping" between layers. Once the primer is thoroughly dried it should then be fine sanded until you begin to see the color of the ABS model through the primer. This step should be repeated until all surfaces are smooth and all voids have been filled in.

Once all surfaces are smooth, another layer of primer, thinned to a consistency that can be sprayed (approximately 4 parts thinner to 1 part primer), should then be applied and wet-sanded with a very fine (minimum 1000 grit) sandpaper or emery cloth. This should also be repeated until the surface is very smooth and no ABS is showing through. It is very important to have a solid coating of primer to ensure uniform bonding of the plating. Also remember that any flaws in the finishing will be visible, and even magnified, once the coating or plating is applied.

Once the part has been filled and smoothed, you will need to determine which plating process is best suited for your application. The two most common processes are electroplating and vacuum metalising, and each process will yield slightly different results. Following is a brief description of these two procedures and their respective advantages and disadvantages to help with your decision.

Vacuum Metalising:
Also known as Vapor Deposition, this is a 3-step process that produces very good results. The part is first coated with a lacquer base material to provide adhesion, and then the metal to be deposited, usually aluminum, is converted into a vapor and is deposited onto the part in a vacuum chamber. A clear top coat is then applied to the finished part to increase gloss and add durability. This clear coat can also be dyed to achieve different colors or to produce the effect of gold, copper, brass or other types of metallic plating.

The metalising process is useful for applications where dimensional accuracy is needed, such as in an assembly, because the total thickness of the coating only adds .002/.003" to the part. However, this type of coating is not as hard or durable as a metal electroplate and can be worn off with repeated use or scratched off with an abrasive.

Electroplating:
The plastic model needs to be made electrically conductive in order for the electroplating process to work, and ABS plastic, the material that FDM models are made from, works very well with this process. The model is chemically etched, which removes the butadiene molecules from the surface and improves bonding of the subsequent layers. Once etched, the part is then coated with a layer of palladium, which acts as an intermediate bonding agent, followed by a layer of nickel to provide the necessary conductivity. At this point, the model is placed in a tank containing a solution of the metal to be deposited and given a negative electric charge, which attracts the positively charged metal ions from the solution and becomes a solid metal again.

Hard chrome electroplating gives the plastic model a very durable coating, but it can have a tendency to make the part somewhat brittle. It may be better to only plate surfaces or areas that will be visible and allow the unplated areas to absorb and dissipate any possible impact stress. Also, if a part will need to bend or flex it should not be plated at all because the thin layer of plating can crack.

Another thing to consider is that an electroplate will most likely be thicker than a metalised coating, so it may not be suitable for use when dimensional accuracy of the finished part is critical. This process is much harder to control and can add an average of .010"/.020" to the size of the part. If accuracy is an issue, it would be a good idea to discuss this with your selected plating vendor; they may be able to control the process more tightly to conform to a certain thickness. Otherwise, you may need to downsize the model, either through overall scaling of the STL file before building or selectively removing material during the finishing process.

## References & Links

Product Information:
http://www.ppg.com/refinishftpsite/docs/p-133.pdf

MSDS Sheet:
http://www.ppg.com/_private/FrameResult.asp?f=/refinishftpsite/msds/ewdz3.txt

## Foundries

Associated Electroplaters, Inc.
1420 East Nine Mile Road
Hazel Park, MI 48030-1902
Phone: (248) 547-5520
www.associatedelectroplaters.com

Perfection Finishers, Inc.
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Phone: (419) 337-8015
www.perfectionfinishers.com

American Electroplaters and Surface Finishers Society
12644 Research Pkwy.
Orlando, Florida
Phone: (407) 281-6441
www.aesf.com

Finishing.com, Inc.
503 Brick Blvd. – Suite 106
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Phone: (732) 477-1447
www.finishing.com

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