Valuable Foam Latex Information

About Foam Latex

Foam latex is a lightweight, soft form of latex which is used in masks and facial prosthetics to change a person's outward appearance. *The Wizard of Oz* was one of the first films to make extensive use of foam latex prosthetics in the 1930s. Since then it has been a staple of film, television, and stage productions, as well as finding use in a number of other fields. Its original formulation began in 1936 and was the work of makeup chemist, Charles Gemora. It was first used on *The General Died at Dawn* for some Asian eyelids on actor Akim Tamiroff.

As a material for making prosthetic appliances for special makeup effects, foam latex is, in my opinion, unrivaled for performer comfort. Materials such as silicone might mimic the appearance and feel of human skin more believably and realistically, but silicone does not breathe, and an active actor wearing silicone appliances will begin to perspire rather profusely beneath the silicone if it is worn for an extended period of time, as many actors must. Gelatin will probably start to melt. Don't get me wrong; the material for a given appliance should not be chosen randomly or by economy, and I have nothing against working with silicone or gelatin as an appliance material. Appliance materials must be chosen based on numerous factors: Climate, shot framing, performance, and budget. There are a number of foam latex systems on the market, and they are listed in the appendix on the companion website.

I particularly love foam latex for its texture and feel. When it's made well, it feels better than velvet, and every subtle expression and nuance of emotion is translated beautifully through the foam from the performer; it *becomes* the performer. A nearly full-face appliance will likely weigh less than an ounce and, when applied, is almost undetectable by the actor wearing it. Foam latex breathes somewhat – certainly more so than silicone or gelatin, so it is comfortable and an actor can wear it all day long, as is frequently the case. Adhesion techniques can also help channel away perspiration from the performer aiding in the actor's comfort level over time.

Foam Latex Quirks

However, although foam latex is extremely light, strong, breathable, and expressive, there are some qualities that could be construed as negatives by some. I must confess, to get that extremely light, strong, breathable, and expressive appliance, there are a number of hoops that must be jumped through to get there. Though every material used to make prosthetics has quirks and idiosyncrasies, foam latex is probably the most difficult material to work with overall, from several perspectives.

First, foam latex is opaque. You can't see through it. Unlike silicone and gelatin, which can be colored intrinsically to be semitransparent or translucent, just like real human skin, foam latex is naturally opaque. To create the semblance of translucency, the appliance must be painted with numerous transparent layers of pigment, usually with an airbrush, to achieve the look of real skin.

Second, foam latex requires a heat cure in an oven, and it *cannot* be the same oven you use to bake tollhouse cookies and Thanksgiving turkeys!

Why? Because third, foam latex gives off toxic fumes during the heat cure that will render your oven forever unfit for cooking. There are a few alternatives, one of which is building your own makeshift oven using infrared heat lamps in a well-insulated plywood box. I can show you how, if you're interested. I used to use an old GE consumer oven that I rewired from 220v to 110v. It's not very large, but I can fit a two-piece mold for a full-face appliance and two smaller molds in it pretty easily. I might be hard pressed to get a full bust mold for an over-the-head cowl in it, but it has served its purpose well, and I couldn't pass up the price—*free*—when a neighbor remodeled his kitchen and asked me if I had any use for his old oven. (On the plus side, I got terrific results with it.) I now have a large oven that I built; I have a DIY tutorial video on YouTube if you're interested in building one of your own (https://www.youtube.com/watch?v=u5KWz9F0u3E).

Foam latex is time and temperature sensitive. When I was first learning how to run foam, I remember mixing the foam according to the instructions for using GM Foam and watching the foam solidify in mid pour from the mixing bowl into the mold. D'oh! It was like watching a cartoon.

Foam latex shrinks. The denser the foam, the more it shrinks. That's not to be confused with the volume of the foam; lower-volume foam (heavier) will shrink more than high-volume foam (lighter) because it has more air and a lesser proportion of foam latex components. It is water loss that causes shrinkage in the foam. Since higher-volume foam stretches more than denser low-volume foam, any shrinkage that does occur can usually be compensated by stretching, with little force exerted on the foam.

What the mold is made of also contributes to the shrinkage of the foam or the lack thereof. A porous mold like Ultracal will cause the foam to shrink less because it absorbs moisture from the foam.

Foam latex, being essentially a foam rubber sponge, will collapse into itself when it moves, such as with a fold of neck skin; silicone appliances displace themselves remarkably like real tissue. These are tradeoffs that you must decide on during the design (and budgeting) phase of your makeup. Foam latex is more delicate than silicone and rarely survives removal in one piece at the end of the day, necessitating fresh appliances for each performance day the actor is in makeup. Silicone, if handled and treated carefully, can be robust enough even for delicate edges to survive multiple applications.

Foam Latex Back Story

Latex is a natural liquid that comes from the Hevea tree grown in Malaysia, Thailand, Indonesia, the Philippines, and other tropical countries. The tree is tapped and a small amount of latex (only a few ounces) is collected from each tree before the cut on the tree congeals and heals itself. Each tree is tapped only once every two days. According to GM Foam's technical information, over 95 percent of all natural latex is concentrated by a method called *centrifuging*. The result is a high-quality product containing 60–65 percent solids, used mainly for dipping compounds such as rubber gloves and condoms. The remaining latex, which is less than 5 percent of the world's production, is concentrated by another method called *creaming*, a process whereby ammonium alginate is added to the raw latex, causing separation. The watery "serum layer" is drained from the vats, leaving a higher concentration of latex.

Ammonia is added as a preservative; this prevents the latex from coagulating, leaving the final concentration at approximately 68 percent latex solids. Creamed latex separates over time and will continue to separate unless it is shaken on a weekly basis, to keep it mixed and fresh. This type of latex has a greater stretchiness than the centrifuged latex, so it is also considered the best latex for making prosthetic foam.

Since latex is a natural product, its composition is dependent on environmental conditions. The Hevea trees and the latex are affected by how much rainfall there is in a given season, how many sunny days, how young the trees are, and so on. Thus, the quality of rubber varies from season to season, year to year, and month to month. These fluctuations can wreak havoc for artists running foam for makeup effects, because the latex will behave differently all the time. What GM Foam does when it purchases creamed latex is to calibrate its own latex base. When the company receives the latex, it first adjusts the pH balance, then conditions the latex with additives and finally makes a special blend with other types of latex. By doing this GM Foam can carefully control the cell size, foam volume, flow, and gel time. This means that if you follow the instructions provided with GM Foam latex, Monster Makers or Burman, the foam should perform exactly as predicted, every time. In theory. Though there is significant science involved in making foam latex prosthetics, it is every bit as much an art.

Provided that you have already created your appliance sculpture, made the molds, and dried, sealed, and released them properly, you are now ready to run some foam! Basically, the operation goes like this: A batch of latex is mixed together with a foaming agent, a curing agent, and a gelling agent and maybe even a little pigment for color. It is whipped into frothy foam at high speed in a mixer; I use a 5-quart KitchenAid, kinda like beating egg whites into meringue. Then it's poured or injected into the mold and the mold is placed in the oven and heated at 170°F (76°C) for about 4½ hours. Any temperature above 185°F (85°C) and you will risk overbaking your foam and ruining it. More about baking temperatures later.

Regardless of your location, some experimentation in mixing the foam might be in order to find the right blend of mixing for your foam. Gil Mosko, creator of GM Foam, makes a point of telling people, "Don't be a slave to the schedule. All mixers run differently and many conditions can affect how the foam will rise in the mixer." A key point to remember is that *you must be able to pour the foam from the mixing bowl into the mold*. If the foam is too light and fluffy, which happens when you achieve a very high volume of foam, you may get a really, really soft-cured foam, but you are also very likely to have enormous empty cavities where the foam was unable to get into all parts of the mold due to the lightness of the high-volume foam and its non-pourable condition.

Valuable Foam Latex Information

Your mold must be sealed and released—both the positive and the negative—to prevent the foam latex from sticking and tearing when you attempt to remove it after it cures. If you are using GM Foam, follow the simple instructions for GM's release agent. If you are using different foam, do as you're instructed for that product. Price-Driscoll's Ultra 4 Epoxy Parfilm works pretty well (but only if the stone mold you're using has been sealed and is no longer porous).

What the high-speed mixing does in addition to creating high-volume foam is remove ammonia from the latex. Too much ammonia loss and your foam will gel too quickly; not enough ammonia loss and your foam might not gel at all. It might seem like you need a degree in chemistry to run foam (it certainly wouldn't hurt) but that is why there is a mixing guideline to follow, so you don't have to know specific pH values, acidity and other scientific-type stuff. Simply understanding the function of the ingredients and the stages of the process should be enough information to do some experimentation. Such as:

- The *foaming agent* bonds as a soap that bonds to the cells of the latex, lowering the surface tension of the latex and allowing it to froth and rise more easily.
- The *curing agent* contains sulfur to help vulcanize (to strengthen and add elasticity to) the latex.
- The *gelling agent* creates a reaction that changes the foam from a liquid into a solid. The mix is basically bentonite clay filler, water and Sodium Silicoflouride. That's it. It's the one standard formula across all brands of foam latex.

Record detailed notes of what you do when you are just beginning to work with foam latex as well as when you make changes to any part of the process. You'll be glad you did when it comes time to troubleshoot… and you will, at some point. Things you might want to include in your notes are:

- Air temperature
- Humidity
- Curing agent (amount, brand, date, and batch number)
- Foaming agent (amount, brand, date, and batch number)
- Gelling agent (amount, brand, date, and batch number)
- Latex base (amount, brand, date, and batch number)
- Additives: accelerators, stabilizers, etc.
- Mixing times
- Pigmentation (amount and color)
- Gel time: start and finish
- Baking time: in and out
- Oven temperature
- Mold: Ultracal, fiberglass, old, new, etc.
- Results

So here's the drill:

Prepping the Mold

Foam can be run in a variety of molds, including gypsum, fiberglass and epoxy. Ultracal is porous, so it needs to be properly sealed and released to prevent the foam latex from adhering to the mold. Every bit as important as sealing and releasing the mold is making certain that there is no moisture left in the mold before baking foam latex in it. This is important for two reasons. Residual moisture in the mold will prevent moisture from the latex being absorbed by the mold, thereby causing the foam to shrink more after curing. Moisture in the mold can also cause steam pockets to form within the mold, which can ruin the foam. Water heated under pressure (as in a clamped, sealed mold) can boil at a lower temperature than normal (212°F—100°C), such as those needed for baking foam latex (under 200°F). To prevent that from happening, your stone molds should be heated for several hours at nearly 200°F (93°C) to remove any residual moisture. This is particularly true of new molds.

The same is true of fiberglass molds—not to remove residual moisture (because there is none) but to vent off styrene remaining in the mold, which can react badly with the sulfur given off during the foam latex-curing process and transfer to the foam.

Filling the Mold

There are really only two ways to get foam latex into the mold: pouring it in or injecting it into the negative mold. For molds that are no larger than a face, pouring works very well.

If there are deep areas in the mold, such as a long nose for the character of Cyrano de Bergerac (think Steve Martin's character in the movie *Roxanne*), you might first want to spoon or use a spatula to get some foam down into the nose tip to ensure that it fills and doesn't create an air pocket before you pour or spoon in the rest of the foam. You will learn over time how much or how little foam you actually need to place in the mold to fill it; when you press the positive into the negative, the foam will spread out and into other areas of the mold. If there are deeper portions the foam needs to reach, you will want to use a spatula, craft stick, or even your hand to spread it into those areas to avoid trapping air.

As the foam is pressed outward by the positive, the excess has to go somewhere; that's why you created flashing when you made the mold. It might even be worthwhile to have drilled small escape holes, called *bleeders*, in the positive to help facilitate the escape of air and excess foam latex. Foam latex has a lot of resistance to compression, and for your appliance to have fine, ultra-thin edges, both halves of the mold must be able to close completely and touch at the mold's cutting edge.

It's often necessary to inject the foam latex into a mold—say, for a full head cowl piece or large three-piece mold (one inner core positive and two front and back negatives) that would be difficult or very messy to hand-pour.

Large foam injection syringes are available for sale from several sources listed in the appendix. When foam is injected, it is fundamentally different than when you pour the foam onto an open mold. The mold is tightly closed, making it almost airtight, and the act of injecting foam into the mold will create pressure in the mold; air in the mold will need to escape. Without numerous small bleeder holes drilled or bleeder channels etched into the mold positive, foam will not be able to flow easily into those areas.

Once the foam has gelled (you can tell by gently pressing on the foam; it should give a little and bounce back), you can place the molds in the oven and heat them until the foam is fully cured.

Heat-Curing Foam

Once the mold is closed and the foam has gelled, it's time to pop it into the oven. But first, you need to understand the following: ***(1) Higher temperatures make the foam gel faster, and (2) higher humidity makes the foam gel faster.*** To correct for these conditions, follow these tips: *In hot and/or muggy conditions use less gelling agent into the mix and pour it sooner. Another way to extend your working time is to add extra foaming agent, which will prevent the latex from gelling too fast. GM Foam offers a product called Foam Stabilizer that is designed for use in high-humidity, high-temperature environments.*

The following points are also very important to understand before embarking on a foam run:

- The cure "window" is larger at lower temperatures. At 185°F (85°C), foam can take 3 hours to cure, but at 4 hours it could be over-cured. This over-cured foam loses tear strength and in extreme cases becomes crumbly. The same foam, cured at 165°F (about 78°C), could take 5 hours to cure, but even if cured for 7 hours it would still be fine. In other words, a low-temperature cure could have a 3-hour window where the cured foam would be usable. A 200°F (93°C) cure may only have a 20-minute window where the foam is usable. I now bake at 135°F (57°C). That creates a much larger window of opportunity, and will actually result in a softer foam!
- Steam lakes are areas of foam that have been pushed away from the mold surface by pockets of steam, and then cured into that incorrect shape. These areas have all the detail of the sculpture, but they are depressed and too dense. This is a hazard in nonporous molds, such as epoxical and fiberglass, or molds that have not been properly pre-dried. However, it is a problem that can be remedied:

1 The first step is mold preparation. Nonporous surfaces are to be coated with a thin solution of paste wax (such as Johnson's wax for floors) that has been cut with 99% alcohol. This "alcowax" should be thin and runny. Brush it into the inside of the mold, do not allow to pool, and when it's dry, brush it out with a dry brush. The mold surface will become polished and shiny. More important, the mold surface will be sealed from outgassing, which causes sites for steam laking to begin.

2 Cure at a lower temperature (for a longer time). GM Foam recommends curing at 165°F (78°C) for 5 to 7 hours for this kind of mold.

The oven you cure the foam in should be capable of reaching 185°F (85°C). Small molds will most likely need only 2–2½ hours; larger molds might need three to four hours. However, if the mold is thin—say, ¼-inch (5 mm) fiberglass—it can be baked at a much lower temperature for a longer period of time—140°F (60°C) for four to five hours. Even thicker gypsum molds will benefit from lower temperatures and longer times; for one thing, it's less stressful on the molds, and you'll get the added benefit of softer foam (without having to deal with a high-volume, non-pourable foam from the mixing stage). Monster Makers suggests trying a typical gypsum mold at 140°F (60 °C) for 10 hours and comparing the feel of the resulting foam with foam run at a higher temperature for a shorter time using the same mold. Foam cooked longer at a lower temperature is going to be softer; less dense foam will also shrink less than denser foam latex.

I am predominantly using epoxy molds now – which can be much thinner than gypsum molds - and I am cooking at 135°F (57°C) for about the same length of time. Baking at a lower temperature will give you a bigger window of opportunity or margin of error for over-baking your foam, which is good.

Removing the Appliance

Once you determine that your foam is fully cured, turn off the oven and let the molds begin to cool. If you try to cool the molds too rapidly, they will crack and break; you do not want to rush the process! When the molds are still warm to the touch, you can carefully demold your appliances; they will come out more easily when warm than if you let the molds cool completely.

Carefully pry the mold halves apart and help remove the appliance with the use of a blunt wooden tool (so you don't scratch the mold's surface detail), powdering as you go to keep the thin foam edges from sticking together. I want to stress this point: You probably went to a fair amount of trouble to ensure that your appliance would have thin, beautiful edges; if you are not careful and methodical about powdering the appliance during removal, your thin beautiful edges will fold over on themselves and become thick ugly edges that you can't separate. Or, they'll tear.

After you've removed the appliance, it must (should) be gently washed in warm water containing only a few drops of dishwashing liquid (I use either Ivory or Palmolive dish soap) to remove any residual sulfur from the curing agent. Repeat this procedure until there is no more visible residue yellowy tint to the water, then rinse until all the soap is gone, and gently squeeze out the water; you might want press the appliance between two towels, then allow it to dry completely on the lifecast or a vac form from the lifecast if you have access to such things so that it will maintain its shape.

When the foam pieces have been washed, dried, and powdered, they should be stored resting in their natural curvature in airtight containers, away from light if possible. It is convenient to use either zip-lock plastic bags or plastic refrigerator containers that have airtight lids. These baggies or plastic containers can then be stored in a cardboard box or any other opaque container that can keep out the light. If stored like this, foam latex pieces can be kept for years without any deterioration. If a foam piece is stored or left to air out with a crease or fold in it, the piece could wind up with a permanent crease line or indentation. Store the appliances in their natural curvature.

Now the foam is ready for painting and application. How do we actually get to this point?

Running Foam Latex

GM Foam/Monster Makers Foam/Burman Foam

A typical batch of foam latex consists of:

- 150 grams of high grade latex base (Monster Makers now recommends ***170 grams*** per batch)
- 30 grams of foaming agent
- 15 grams of curing agent
- 14 grams of gelling agent

[*NOTE: You can make smaller batches that a 150/170 gram batch (as well as larger), but if you go smaller than a ½ batch, take detailed notes as your ratios may need adjusting; precision measuring becomes more critical.*]

There are other ingredients and quantities that can be added for different foam characteristics, but this is a good place to begin. As I mentioned in the text, this operation is time and temperature sensitive as well as humidity sensitive; optimal conditions would be in a room 69–72°F (20.6–22 °C) with 45–55 percent humidity. I live in Colorado, so I have humidity (rather, the lack of humidity – 20% ish) to contend with, as well as a higher elevation air pressure that also affects what I do. The "optimal" conditions are based on mixing at sea level; I'll show a schedule for both sea level and high altitude, though most of you will probably be working at lower elevations.

Foam latex can be cured in molds made of a variety of materials, including Ultracal 30, dental stone, fiberglass, epoxy, silicone, aluminum, or even steel, and should only be mixed and cured in rooms with good ventilation; foam latex gives off unpleasant and unhealthy fumes.

Weigh the first three components—the latex base, the foaming agent and the curing agent—and add them to the mixing bowl. It would be great if you have an accurate digital gram scale. Weigh out the gelling agent into a small cup and set it aside. We won't add that until we're almost done mixing. If you're adding pigment, put a few drops of your color into the bowl, too. Then place the mixing bowl into position and you are ready to begin. This first description will be a 12-minute mix. A timer that will count down is a plus, but if you can tell time and count, a clock or a watch will suffice.

1 For the first minute, mix the ingredients on speed 1.
2 For the next 4 minutes, whip the ingredients on speed 10. This will froth the foam and increase the volume (and lower the foam density) in the bowl. Gil Mosko, GM Foam's founder, says to not be a slave to the schedule. All mixers run differently, and many conditions can affect how the foam will rise in the mixer. Once you understand how foam latex works, you will be able to adapt to any situation.
3 Now, turn the speed down to 4 for 1 minute. This stage will begin to refine the foam, breaking up the biggest bubbles.
4 Turn the speed down to 1 for the last 4 minutes to further refine the foam. When there are 2 minutes left, begin adding the gelling agent and continue mixing until 12 minutes. It is critical that the gelling agent be mixed well, and depending on what mixer you use, the methods of assuring that the gelling agent is sufficiently mixed might vary.
5 At 12 minutes, turn off the mixer, remove the bowl, and you are ready to carefully fill your molds. Once the foam has gelled (you can tell by gently pressing on the foam; it should give a little, and bounce back) you can place the molds in the oven and heat them until the foam is fully cured.

Note

This recipe is the general one recommended by GM Foam *at sea level*. I suspect Monster Makers and Burman would concur. Check with each manufacturer to be certain.

I have had good results with these times, but I have also had disastrous results with these times; a movie I did several years ago in Colorado required numerous foam appliances, and the following mixing times worked beautifully every time and has become my high-altitude schedule with a KitchenAid mixer. It is a 9-minute schedule instead of a 12-minute schedule:
09:00 Speed 1 - *Mix Ingredients*
08:00 Speed 10 - *Whip to volume*
07:00 Speed 4 - *Break largest bubbles; remove ammonia*
05:30 Speed 1 - *Refine bubbles*
03:00 Speed 1—*add gelling agent*
00:00 Stop

Monster Makers' schedule is this:
12:00 Speed 1
11:00 Speed 10
07:00 Speed 4
06:00 Speed 1
02:00 Speed 1—*add gelling agent*
00:00 Stop

These schedules can be varied. Be sure to take notes of every change made, and don't be a slave to the schedule!

Valuable Foam Latex Information

Foam Latex basics: In general, the Curing agent will be roughly 10% of your foam base, the Foaming agent will be about 20% (This way you can mix varying amounts in appropriate combination).

If your foam gels too fast, shorten the run or add less gelling agent. If it gels too slow or not at all, run it longer or add more gelling. Not a lot after that... Since gelling varies depending on temp, humidity and times, it can be similar to the 10% of curing but the many factors affecting it make it a +/- kind of thing according to conditions.

As always, keep good notes and zero in on perfection!