# Perma-Gel<sup>®</sup>

# **TECHNICAL NOTES**

# Background

Perma-Gel® is a chemical compound which simulates human body tissue. It is factoryformulated to ensure a very high degree of consistency. When used for ballistic testing of ammunition it very closely follows the results obtained when testing expanding handgun rounds in A250 ballistic gelatin. Although results obtained in Perma -Gel® are not exactly those obtained in A250 the correlation is very high.

Perma-Gel is best used at temperatures ranging from 65°-75° F. slight variations will not affect the performance. Perma-Gel can be pre-cooked and stored prior to or after use for extended periods without loss of integrity.

Perma-Gel is a factory-made compound that can be reused many times with the consistency remaining constant from use to use.

# Safety

PERMA-GEL, Inc. instructs all users of the product to refer to all safety precautions supplied by manufacturers of specific firearms, ammunition and components. In addition, PERMA-GEL, Inc. assumes no responsibility and/or liability for constructing and/or using appropriate backstops or other firing range equipment. The safe use of this product lies solely with the end user who is instructed to take all necessary precautions normally associated with the use of firearms.

As with all chemicals, always read the SDS (Safety Data Sheet) to learn about the safe handling and health hazards of each chemical.

# **Kit Components**

- 1. Roasting Oven
- 2. Thermometer
- 3. Perma-Gel raw base mix

# Precautions

There are two areas of concern in working with PERMA-GEL.

- The presence of even trace amounts of water during remelting will result in droplets which will sink to the bottom of the gel (water being heavier than gel) and then slowly turn to steam, resulting in bubbles which are difficult to remove without extended holding times above 212° F.
- 2. Gel temperatures above about 250° F, even in localized regions, result in slight smoking and discoloration, thereby reducing the useful life of the gel. Although not a fire-safety concern (flash point is above 360° F, which should never be approached), resist the temptation to accelerate melting by setting the oven above 250° F, as you will only shorten useful life of the gel without significantly reducing melting time. Individual oven thermostats vary somewhat, and it may therefore be helpful to use the supplied thermometer to determine actual gel temperatures.

# **Preparing the Block**

Upon receipt, attach the handle to the oven lid. Using a dry cloth, wipe the underside of the lid clean of any dirt or dust to prevent it from falling into the raw mix. DO NOT USE A DAMP CLOTH as any moisture that gets into the mix may cause difficulties with the melting process.

- 1. Place raw block material into clean pan
- 2. Set the thermostat to 225-250° F and cover with the lid. The lid must be used to prevent dust and dirt from settling on the gel material during the curing process
- 3. Let the gel cook for about 3-4 hours. Remove the lid to inspect the consistency of the gel. You should observe that most or all the material has melted to a thick liquid state. If it has not, or if there are an unacceptable number of air bubbles present in the solution, the mix can be gently cut to mix the remaining material that has not melted or to release the bubbles. The mix is cut using a wooden paint stir stick or a silicone spatula. Once the cutting is complete, replace the lid and continue cooking. When the material is free of unmelted material and bubbles turn off the power and allow to cool.
- 4. Let rest and cool for at least two hours before removing the inner pan from the roaster.
- 5. The whole block and be divided into two blocks by adding a think barrier and dissecting the block lengthwise. The barrier material can be made of most any material, plastic, wood, cardboard. The barrier is slowly inserted into the liquid and remain while the block material cures.
- 6. The entire cooling and hardening process will take about 16 hours at room temperature. The cooling process can be sped up by floating the pan in cool water or placed in a refrigerator until the gel has hardened. There are no detrimental effects to Perma-Gel when exposed to sub-freezing temperatures.
- 7. To remove cooled gel block(s) from the pan, pour about a cup of water on each block to serve as a lubricant between your fingers and the gel. Separate gel from all vertical mold surfaces with fingertips. Gently slide your wet, flattened hand between gel and mold at one end of a block, then lift upward while slipping fingertips under the block. (Caution: brute force can tear the gel!)
- 8. The block is now ready for use.

# **Reusing the Block**

1. Press dry, used gel blocks back into the clean, dry inner roaster pan. This is most easily done by slicing about 1-1/4 inches off one end of each block, rotating the blocks 90 degrees from their original orientation in the pan, then placing the two end slices in the

gap between the blocks. Be sure that no water drops, or perspiration are allowed to enter the gel or pan as this results in the formation of bubbles as explained below!

- 2. To capture any projectile debris deposited in the gel during testing, a pair of pantyhose can be stretched over each block and knotted prior to reintroduction into the heating pan. Once the blocks have liquefied again, the pantyhose and debris can be easily lifted from the solution.
- 3. If pantyhose is not available, simply allow the debris to settle to the bottom of the block.

# **Use of the Block**

Once the block is cooled and removed from the cooking pan, there are two methods for use.

 The block can be used whole, depending on the caliber of weapon and type of ammunition used for testing. Typically, low mass and small caliber ammunition can be fired into the single block without the projectile exiting the back of the block. By using the entire block for this type of testing multiple shots can be fired into the block to demonstrate repeatability of the ammunition/weapon.

- 2. If the block is cured whole and not as two pieces, the block can be cut into two pieces, lengthwise. This is recommended use of the test blocks. The two blocks are laid end-toend on the table. The weapon is fired into the small end of the block, allowing the projectile to penetrate both blocks as it travels downrange. In most cases with medium to high caliber projectiles, the projectile will travel through the first block demonstrating the ballistic pattern of the projectile and will come to rest in the second block. Thus, the second block acts as a safety mechanism to allow for capture of the projectile.
- 3. If the skin of the block becomes cloudy from handling the surface can be cleared using a heat gun or hair dryer. Blow hot air over the surface until it liquefies and clears the cloudiness away. This can be repeated as necessary.