Gathering Summary: Making Soap at Home, by Kathy Mansfield, January 26, 2011

Summary by Catherine Haug;

Photos by Kathy Mansfield, unless otherwise noted.

Introduction

Kathy became interested n making soap when her husband bought some handcrafted soap, and she fell in love. To learn how to make it, she read a few books and got ideas on-line. One of her favorite parts of soapmaking is product development for her Snowbunny Soap line - the creative aspect.

Her biggest challenge is marketing, and making sure she can meet demand. Her advice to prospective entrepreneurs: "Taking it slow is key to success."

This was a long presentation; consequently this summary is long as well. You can view her accompanying slide show at: Handcrafted Soaps for ESP, by Kathy Mansfield (3).

What Is Soap?

Soap is a surfactant, meaning that it cleans at the surface. It is made from three primary ingredients:

- Fats and/or oils
- distilled water
- alkali

The fats are comprised of glycerin and fatty acids bonded together. When the water and alkali are added, the fatty acids react with the alkali to form soap, releasing glycerin which adds moisturizing qualities to the soap.

This reaction, called **saponification**, happens very quickly, in about 1 - 2 minutes.

➡ Question from audience: What is the difference between a detergent and soap?

Cat answered this one: both are surfactants (clean at the surface), but they are made from different ingredients.

- True soap is a relatively simple molecule, made of sodium (or potassium) and a fatty acid. Soaps have only two words to their name; for example, sodium laurate or potassium tallowate.

  Handcrafted soaps are made from all natural ingredients (not synthesized from petroleum). Many soaps lather well, are non-drying, and some are moisturizing. Soap

doesn't rinse away as well as one would like, but an acidic rinse (diluted vinegar or lemon juice) resolves that problem.

Soaps can exchange minerals with those in hard water, creating soaps that are insoluble in water and leave a "soap ring."

- Detergents are a more complex molecule, with a sulfate, amine or other group in the molecule. Their names are also more complex, with typically three or more words (some as acronyms) to their names; for example, sodium lauryl sulfate or TEA cocyl glutamate.

  Most detergents lather very well, but are drying, and non-moisturizing, so use of moisturizer on hair, scalp or skin is recommended. Detergents are more soluble in water, and rinse away better than soap. They do not typically form insoluble scum, even in hard water.

Because this difference is fairly complex, Cat offers a Soap vs Detergents (3) post.

Soapmaking Ingredients

Fats & oils

Different fats and oils provide different properties to the resulting soap. See The EssentiaList: Soap Additives for more.

Some fats/oils are 'primary,' meaning they provide the bulk of the fatty acids for the soap. For example, olive oil, coconut oil, palm oil, and tallow are the most common primary oils. 'Specialty' fats/oils such as shea butter, castor oil, sweet almond oil and avocado oil are used in smaller quantities for the specific qualities they bring to a soap.

Kathy's base formulas:

- soap bar: equal parts olive and coconut oils, with just a little less shea butter. For example, 1.5 oz each olive and coconut and 1.37 oz shea for one 5-ounce bar of soap.
- shampoo bar: coconut, olive, palm, castor & sweet almond oils provide a good lather.
- liquid soap: mostly olive oil with a little bit of coconut oil (coconut oil tends to be drying, so only uses a little bit)
- She makes 18 bars at a time, using a wood mold made by her husband. This amount requires abut 10.73 oz lye, for her base formula.

➡ Cat's comment on sustainability: While many handcrafted soaps use plant oils such as olive, coconut and palm, these cannot be grown here in NW Montana. When it becomes to costly to import such oils (due to rising cost of fuel), we must resort to using animal fats for homemade soaps (tallow, suet, lard, etc.). While seed oils such as corn and soy can be grown here, it is difficult to extract these oils at home.

Distilled water

Distilled or filtered water is used to dilute the lye, and at other steps in the process.

Alkali

>>> Caution: lye is corrosive and caustic <<<

You need 100% pure lye, obtained from chemical or soap/candle companies such as Bramble Berry in Bellingham, WA (5). The lye that you can buy to clear drains is no longer true lye and will not make soap.

There are two kinds of alkali used for soap making:

- NaOH (sodium hydroxide) for bar soap
- KOH (potassium hydroxide) for liquid or soft bar (glycerin) soap

➡ Question from audience: Can do you make lye?

Kathy has never made her own lye. Cat noted that in older times, people used to burn wood to ash, then wash it with water, which makes a lye solution. Then melted fats were added to the solution, and stirred. The soap floats to the top of the mixture.

➡ Audience comment: Hardwood makes the best homemade lye.

Additives

The use of additives (4) is not necessary, but can add/improve qualities of the soap. See Kathy's Soap Additives handout (2).

- **Fragrance**: This includes essential oils (pure distilled plant oil) and fragrance oils (not pure and natural, but are synthesized, because the natural fragrance cannot be extracted). Florals, banana and coconut are examples of fragrance oils. Fragrance oils can also be a blend of essential oils.

  Never put an essential oil directly on skin. Add it to a carrier oil (such as olive oil). Some essential oils can be harmful to the skin.

- **Colorants**: Use cosmetic grade colorants from a soap-making supply, or natural things like cinnamon and cloves (dried & ground), coffee grounds (must be completely dry or will cause rot).

- **Exfoliants**: These help with removal of dead skin cells and include things like oatmeal (don't use quick cooking kind), coffee grounds, cornmeal, & small seeds.

Dried and ground herbs, or tea, can lend color & exfoliating qualities, but not much fragrance. To dry herbs: hang them out of direct sun, and in a well-ventilated area.

Safety Precautions

When mixing lye with water, it produces heat and steam. NaOH will reach 180° F immediately; KOH will reach 145° F or so. Lye is also corrosive. Thus it is important to take special precautions when working with lye, to avoid burns:

- Wear protective safety glasses
- Wear long sleeves
- Wear long gloves

- Work in a well-ventilated area
- Always add lye to water (never water to lye or it will explode)

➡ Question from audience: What does corrosive mean? Is lye different from acids in this regard.

Cat answered: Both acids and alkalis can be corrosive. Corrosive means that it can burn you on contact, and it can also destroy or irreversibly damage substances with which it comes in contact. If you get lye on your skin, it will feel slippery, or soapy. This is because the lye is reacting with the natural oils in your skin to produce soap!

Always use distilled or filtered water, to avoid other minerals that could react with the fat/oil.

After mixing the lye with distilled water, you need to cool it (such as setting the pan/bowl in an ice bath) before you can add it to the fats.

Soapmaking Processes

Three different processes are used to produce different end products:

- Cold process (CP) for opaque bar soap (with CPOP alternate curing process)
- Hot process (HP) for clear (glycerin) bar soaps and liquid soaps
- Melt and pour process for bar soap

The main differences between hot and cold processes are the reaction temperature for mixing fats with the alkali, and the specific alkali used: cold process requires sodium hydroxide (NaOH); hot process requires potassium hydroxide (KOH).

Kathy spent the most time talking about the cold process, as it is the simplest and most common method. Soapmaking is like cooking: lay out all tools and measure all ingredients before starting.

Cold Process (CP)

This involves the following main steps, each of which Kathy gave much detail and provided photos on her slideshow.

1. Melt and combine fats/oils, and warm to 90° - 110° F;
2. Add lye (NaOH) to water, and cool to 90° - 110° F;
3. Combine fat/oil and lye;
4. Test for trace;
5. Add additives, if desired;
6. Pour into mold(s), keeping warm for 24 hours to cure;
7. Remove from mold(s) and cut into bars.

Each step is detailed below, with Kathy's basic bar soap recipe as the example.

As a beginner, always use a tried & true recipe, and weigh all ingredients accurately by ounces or grams (do not use measuring cups/spoons). Never double the ingredients to make twice as much soap; it doesn't work that way.

Most recipes are superfatted, meaning that extra fat/oil is used for the amount of lye, to ensure that no lye remains after the soap has formed. Superfatting also allows you to express the properties of a particular oil into the soap, such as a moisturizing oil.

Melt and combine fats/oils

Measure each fat on an accurate scale. Some oils are liquid at room temperature; others are solid and need to be melted before combining with other fats/oils. For example, a soap made from coconut and olive oils, and shea butter: melt coconut and shea butter, then add to olive oil.

Use stainless steel or glass container. Kathy uses a stainless blow that has a non-slip rubber coating on the bottom for safety. She melts and warms her fats in the microwave, but you can do on the stove, especially if you use a double boiler.

Then gently warm to 90° - 110° F, measuring temperature with an instant read thermometer you can attach to the bowl.

Add lye to water

Always use distilled or filtered water, to avoid other minerals that could react with the fat/oil.

Accurately weigh amount of lye and water needed per the recipe, then add the lye to the distilled water to dissolve (never add water to lye, as it will explode).

The mixture will heat up quickly to 180° F, which is too warm. Set pan in an ice bath, to cool solution to 90° - 110° F

Combine fats/oils and lye

When both oils and lye solution are at the proper temperature (90° - 110° F), you can combine them. The photo (right) shows adding lye to the oils, but you can also add the oils to the lye. The important thing is to use a container large enough to contain both.

Use an immersion blender (photo, left, from Amazon.com (7)) or wire whisk to blend thoroughly, until 'trace' is reached, about 30 minutes.

The mixture gets opaque as you stir. It should have a thin, pudding-like texture. If you can see oil around the edge, it is not yet ready.

Don't over-blend, as it will be difficult to pour out of the container.

Test for trace

To test for trace, drag blender/whisk across the top of the mixture. If it leaves a track that sits on the top of the mixture, it's done.

Add additives (optional)

Once trace is reached, you can add fragrance, colorants and exfoliants. Be aware that some additives (such as huckleberry fragrance or goats milk) can speed up the hardening of the mixture, making it difficult to pour into the mold. These should be added at a light trace - timing is everything. See Candle and Soap video (9) for more on goats milk in soapmaking.

Pour into mold(s)

If using a wood mold like the one shown here, line the mold with freezer paper. Plastic molds (such as those at JoAnn's) do not need to be lined.

Pour the warm soap mixture into the mold, spreading the top evenly. Then cover with plastic wrap. You want to keep it warm for 24 hours, so cover with towels or blankets to hold the heat in.

Remove from molds and cut

After 24 hours, the soap can be removed from the molds - all the lye is gone so you can handle it with your bare hands. To de-mold from deep plastic molds: put in freezer for a few minutes; then they will fall out of the mold.

Cut into bars before drying. The soap is rather like a hard cheese at this stage, so is not difficult to cut with the right implement, such as a butcher knife or piano wire.

Let bars dry about 3 - 8 weeks before using, in a well-ventilated place, with air movement. For example, on top of a bakers rack. Longer drying time results in harder bar that lasts longer.

Cold-process bar soaps continue to dry out (and get better) with time. Do not wrap in plastic to speed the drying process - it doesn't work.

Cold Process-Oven Process (CPOP) Method

An alternate version of the cold process, CPOP is used to speed up curing/drying time. Use same CP method as described above, except place filled molds in 170° F oven for 2 hours. Then turn oven off and don't open the door for 24 hours. The soap will cool and dry in this time. Remove from mold, cut into bars, and use right away or cure 2 weeks.

Hot Process (HP)

This process is used to make liquid soap, or clear (glycerin) bar soaps. Two versions:

- Alcohol method is used to speed up cooking process, but was not discussed by Kathy;
- Paste method is the only method Kathy has used; requires a stiff stirrer.

The Paste Method involves the following steps:

1. Melt and combine fats/oils, and warm to 140° F in top of double boiler;
2. Add lye (KOH) to water, which instantly heats to 145° - 148° F; cool to 140° F in a water bath.
3. Add lye to fats, blending with strong stick blender, while the pot (top of double boiler) is on the stove. Sets up quickly; when have a taffy consistency, remove stick.
4. Place pot over boiling water-filled double-boiler bottom to keep temperature constant. Stir every 30 minutes over a 3 - 4 hour period. Be sure to use a stiff stirrer, such as a bamboo spatula.

   The mixture will go from opaque to a honey color. It gets clearer as you go until it is transparent - the clearer the better. Her recipe makes 6 pounds and takes about 4 hours to become transparent.
5. After 3 hours, test for excess fatty acids before diluting. HP method does not allow for superfatting; instead, it tends to be on the alkaline side (excess lye). You want to be sure all the fatty acids have saponified. (In a later step, you neutralize the excess lye so that the soap is not caustic).

   Put ¼ - ½ tsp of the soapy paste into 2 oz heated distilled water to dissolve. Then cool (you can put it into the freezer to cool faster). If it is cloudy after cooling, it needs to cook longer; if clear, paste is done. Discard each test after completing.
6. Dilute paste to desired consistency (for liquid soap) after all fatty acids have reacted. Dilute with heated distilled/filtered water at a 20 - 40% dilution rate (soap is 20 - 45% of water amount). The amounts are not critical; some of the water evaporates as it boils.

   To dilute: heat distilled/filtered water to a boil, add the paste. You can stir it, but the boiling water will mix it. If needed, add more distilled/filtered water to get desired consistency.
7. Neutralize excess lye with citric acid in distilled water. Add citric acid solution (½ oz to 2 oz hot distilled water), 1 tablespoon (or less) at a time, to the diluted soap. If you add too much, it will cloud up.

   After each addition, test with pH strips (match against a colored scale), or liquid phenolphthalein (PT) - see below.
8. Pour into glass jars; sequester 1 - 2 weeks, to allow excess fatty acids to settle out of the liquid.

pH & testing with phenolphthalein

pH is a scale of 1 - 14, with 7 as neutral. Less than 7 is acidic; more than 7 is alkaline). Before adding citric acid, your liquid soap will be about 14 because lye is still present. Desired pH for different uses:

- Body soap: pH 5 - 8;
- Hand soap: pH 8 - 10;
- Laundry soap: pH 10 - 12.

To test with phenolphthalein (PT), test only a small amount of the diluted soap at a time, adding 1 drop of the PT. Before adding citric acid, the test will be a deep pink color, indicating alkaline. After adding enough citric acid, it will be the palest pink possible (or colorless for body soap). Discard each test sample before diluting and testing again.

Melt and Pour Process

This is a shortcut method that starts with a soap base from a soapmaking supply company. The base is a clear (glycerin) soap made from liquid soap that is not diluted. Soap made this way has a short shelf life. Keep in plastic or cellophane to prevent drying out.

1. Melt down the base;
2. Add special oils for particular characteristics, and/or additives (fragrance, colorants, exfoliants).
3. Pour into a mold(s) and let it cool 2 - 3 hours (or more if thicker is desired). No need to cure/dry. Kathy showed us a sample of soap poured into a mold with a bit of loofa as an exfoliant.

Commercial vs Handcrafted Soaps

Commercial soaps/detergents are rarely superfatted, and they typically remove the glycerin (a biproduct of the saponification reaction) for other uses. Such soaps can be drying.

Handcrafted soaps are usually superfatted, with 3 - 5% excess fatty acids, and the glycerin is not removed, which make for a more moisturizing soap.

Kathy presented several slides listing some of the chemicals in commercial ‘soaps’ and detergents, along with the toxic affects of these ingredients. Refer to her slides on pages 9 - 10 of the slideshow pdf file: Handcrafted Soaps for ESP, by Kathy Mansfield (3). See also the Environmental Working Group’s Cosmetic Safety Database (6)

Hand Milled Soaps

Hand milled soaps differ from handcrafted soaps, in that hand milled soaps are ‘re-batched’ from a handcrafted cold-processed soap base that is grated and mixed with water usually over heat to liquefy the mixture. Additives can then be added before pouring this soap into molds.

Sources & References

ESP website

1. Kathy's slideshow (Handcrafted Soaps for ESP, by Kathy Mansfield): essentialstuff.org/wp-content/uploads/2011/02/Soapmaking_KMansfield012611-final.pdf
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Other websites

5. Bramble Berry Soap Making Supplies: www.brambleberry.com
6. Environmental Working Group's Cosmetic Safety Database: www.cosmeticsdatabase.com
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