

# Natural cleaning agents

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Probably the largest, but the least recognized pollutant of our homes. In the modern household it is common to own dozens of different cleaning agents and probably every single piece of our belonging was in contact with them. They contain different toxic materials like perfumes, essential oils, ammonia, bleaches, very strong surfactants, oils etc. We do not want these pollutants in our homes, and not in our environment as well. Not only that we pollute our homes with them, we also pollute our environments. Also the cleaning agents' production is not a very environmentally friendly industry.

People are becoming more and more aware of this and therefore there are also some possibilities to buy some natural cleaning agents in the health shops. However such "special" cleaning agents are expensive and sometimes not significantly different from the classical, much cheaper cleaning agent. From the ecological and sustainable reasons, it is the most prudent way that we make cleaning agents by ourselves. It is easy, fun and cost effective!

**Handel all the chemicals with caution. Read the safety datasheet and use all safety precautions. Please feel free to contact me in cases of doubt or when additional information is needed. In any case I cannot assume the responsibility for any undesired incident or damage during preparation or use of the mentioned cleaning agents.**

## Natural soap

We use soap everywhere, even though the need for degreasing is in homes of hygienists almost does not exist, since no oil is used, there is no frying. Anyway, most of the dirt has "oily" non-polar character. If we want to dissolve nonpolar dirt into water and wash the dirt away we need something like soap, which can dissolve nonpolar dirt and it is soluble in water. Soap is like a carrier for dirt in water.

I will always remember the story of my grandmother about how they would prepare the soap for laundry from lard and wood ash or how they would wash their hair with ash and clean the floor with vinegar. This was done especially during the World War II since there was shortage of the supply of commercial products and the poverty of people was high. Of course, as hygienists, due to ethical, environmental and health purposes, we do not want to use any animal product so therefore we have to find the alternative. Due to advances in agriculture different vegetable source of fat have become way cheaper than they used to be in the past. Sunflower oil is probably the cheapest oil of all and it is environmentally acceptable. Therefore, we can use it as a main source of fat for production of the soap. Also other vegetable oils are suitable and even required for production of the soaps with desired properties such as lower solubility, higher hardness, higher degreasing capacity, bubbliness... Namely all these properties depend mainly on composition of fatty acids in the oils. As we now live in modern industrialized era we can buy much more ecological and cost effective, and especially odorless and tar, toxins and soot free lime. Lime is produced as a byproduct of a chemical process of electrolysis of salt water. We can also buy other cleaning agents which are environmentally friendly, which is more effective than making these basic agents at home for ecological, economic and practical reasons, however, it is entirely possible to make them at home. Chemicals like lime, washing soda, sodium bicarbonate, citric acid, hydrogen peroxide and isopropyl alcohol are such chemicals.

## How to make soap

So the main ingredients for soap preparation are vegetable oil, sodium hydroxide, isopropyl alcohol, water, and some essential oils. Sodium hydroxide is also known under the synonym lye or caustic soda and it is described with chemical formula NaOH, but I will keep using its correct chemical name sodium hydroxide. Isopropyl alcohol is also known as isopropanol, rubbing alcohol or with formula C<sub>3</sub>H<sub>7</sub>OH. Purified water works the best, but any tap water will also do the perfect job.

We will need also a stainless steel, glass, ceramic or enamel 4-liter pot. The components in soap making (soda lime reacts with aluminum), a pot and a hand blender or a stainless steel, plastic, glass or wooden ladle and silicone or plastic container as a mould with the desired final shape of the soaps. I prefer a silicone baking models for cakes.

There are probably countless possibilities for soap recipes. I will include one that works for me. This soap is my usual Christmas gift for my friends and it is used in my home for my guests and myself when the “unnatural” greasy dirt requires washing with soap.

For my recipe for the soap, which yields a yearly demand for soap for a family and friends, you will need:

250 g of coconut oil, 100 g of olive oil, 100 g of peanut oil, 200 g soya bean oil, 250 g sunflower oil, 1 liter of water, 146 g of sodium hydroxide, 50 g of isopropanol, 3 ml of lavender essential oil, 3 ml of eucalyptus essential oil and 3 ml of lemon essential oil.

Put the oils into a pot and heat until all oils are liquefied. In a separate 1-liter glass or stainless steel pot dissolve 146 g of sodium hydroxide in 350 g of water. Be careful because a huge amount of heat is produced by the dissolving process. If necessary, cool the pot in a cold water bath. When all the sodium hydroxide is dissolved in water and the solution is cooled down to temperatures below 40 °C, add 50 g isopropyl alcohol and stir well. The mixture is ready for mixing it with slightly heated oils.

Stir the mixture of oils and sodium hydroxide solution until it becomes thick, gel like liquid. This usually happens in 5 to 30 minutes. Add approximately 500 g of water and mix the mixture until it is homogenous smoothie like liquid. Add the mixture of essential oils, mix it until oils are homogeneously distributed through the liquid and then transfer the liquid into the molds which are kept in boxes for fruit so that we will not deform them by transferring them. When all liquid is distributed in the molds, transfer the molds into a cold and dry place. In the winter time the best place is outside. When soaps become a bit harder, bring them indoors to room temperature and allow them to dry, which takes approximately 14 days. When the soaps are partly dry, remove the soaps from molds and let them dry until hard, for approximately 14 days.

Keep in mind that soaps cannot be used until they are completely dry due to the safety reasons. The sodium hydroxide which perhaps didn't react with oil will slowly react with carbon dioxide in the air and transform into way less dangerous sodium carbonate, known also as washing soda.

For dishwashing and laundry purposes you can also use the cheaper variant of the soap made of pure sunflower oil, which is way cheaper. The whole principle is the same but for 1 kg (this is about 1.1 liter) of oil you will only need 135 g of sodium hydroxide. You also do not need to include essential oils; you will add fragrances later when you will prepare the “Liquid washing agent”.

You can also design you own recipe for the soap. You have to be only careful that you calculate the correct amount ratio between oil and sodium hydroxide, in order to avoid your soap being too aggressive.

For this purpose, you will need to know saponification number for each oil. This is figure which tells you the amount of sodium hydroxide needed for saponification of 1 gram of oil. Usually these numbers are between 0.1 and 0.2. This means that you will need 0,1 g to 0.2 g of sodium hydroxide per 1 g of oil, or 100 g to 200 g of sodium hydroxide for 1 kg of oil.

You can also use some of the online “soap calculators” available online. One of the best is accessible here: <http://soapcalc.net/calc/soapcalcwp.asp>

## Preparation of the liquid washing agent

You need 50 g of dried sunflower oil soap, 50 g of sodium carbonate and 1 liter of water. As mentioned earlier, sodium carbonate is also known as washing soda. Cut or grate 50 g of dried sunflower oil soap into a pot, then add 50 g of sodium carbonate and 1 liter of water. Heat until slightly warm (50 °C) and stir well until homogenous. You may also use a hand blender. When homogenous, transfer it into a container and use it as a liquid washing agent. For a single washing you add approximately 100 ml. The quantity actually depends on the dirtiness of the clothes. You may also add 100 g of washing soda powder into the washing machine.

## Softener

You may use 6 % citric acid or alcohol vinegar (9 % acetic acid); put it in the dispensing compartment intended for the softener. In case you need some whitening properties, also add into the softener dispensing compartment approximately 20 ml of 30 % of hydrogen peroxide. Hydrogen peroxide is described with the chemical formula  $H_2O_2$ .

## Whitening agent

In case you need whitening properties, soak your laundry in a solution of water in which approximately 20 ml of 30 % of hydrogen peroxide and 20 ml of alcohol vinegar (9 % acetic acid) is added. Soak the laundry in this water for approximately 1 hour, wring the clothes and let them dry without rinsing. Hydrogen peroxide ( $H_2O_2$ ) will decompose while drying, additionally whitening the clothes. As we know, it will decompose into water and oxygen, so no harmful chemicals will remain on the whitened clothes.

## Dishwashing

For dishwashing you can use the same solution as prepared for laundry washing. Use it as a commercially available dish washing concentrate; use a slightly wet sponge to distribute the washing agent over your dishes.

## Cleaning floor

Use 5 liters of water with the addition of 100 ml of isopropanol. If you would like to make the floor even more sterile, add 30 ml of 30 % peroxide to do the job. Alternatively, you can also use 5 liters of water with the addition of 100 ml of alcohol vinegar (9 % of acetic acid), but since acetic acid is poisonous to human body and it is volatile, I do not recommend its usage. After cleaning the floor with any agent please ventilate your home well. The smell of any chemical is not recommended or healthy.

## Cleaning windows

You can use the same agent for cleaning windows as for cleaning floors.

## Cleaning of the bathroom elements and removal of the limescale

You can use a 6 % water solution of citric acid or a 4 % solution of alcohol vinegar. Use the sponge to distribute the solution over the cleaning surface. Wash the surface with a wet sponge after a while (5-30 minutes).

## Mold removal

Mold can be harmful at your home, so it is wise to remove it. To do this, mix 30 % hydrogen peroxide with 6 % citric acid in the ratio 1:1 and use a brush to distribute it over the moldy area. Leave it to dry. After drying, wash the area with water or leave it unwashed and paint it over with a paint.

## Unclogging the kitchen sinks

The major cause of the sink clogging is fibrous organic matter which enter in the sink. The source of fibrous matter are hairs, fibers from fruits and vegetables. Usually the sinks can be unclogged mechanically using a plunger.

In certain cases, this option is not possible. Then we have two options. The less aggressive, but also less effective one is to use the concentrated water solution of sodium carbonate (washing soda). The concentrated solution of sodium carbonate can be prepared by dissolving 300 g of sodium carbonate in 1 liter of water. Pour the solution into the sink and leave overnight (or shorter). After the application

you can use the sink normally. If the aforementioned chemical process does not yield successful results you can try the more aggressive one with a use of 30 % solution of sodium hydroxide. In 1-liter glass or stainless steel pot dissolve 150 g of sodium hydroxide in 350 g of water. Be careful because a huge amount of heat is produced by the dissolving process. If necessary, cool the pot in a cold water bath. Pure the solution into the sink and leave overnight. After the application you can use the sink normally. The sodium hydroxide is a common ingredient of the commercial sink unclogging agents, but it is normally accompanied with toxic additives like coloring agents, fragrance agents, surfactants, bleaches etc.

## Car washing

For car washing, you can also use the same solution as for laundry washing. Use as much as necessary to distribute the foam over the whole car. Usually, 50 – 100 ml of the solution is needed. After this, wash the car well with water and wipe it with a dry patch.

## Windshield washer fluid

Cleaning the windshield is especially necessary in the winter months. Since commercial windshield washer liquid contains irritating odorants that we would like to avoid, we have to make such fluid by ourselves. In the summer months and in temperate climates we can use pure water with the addition of a small amount of homemade liquid washing agent (described above); in the winter months, when the temperatures are below 0 °C, this is not a suitable option. For the winter months, the addition of isopropanol or denatured ethanol in quantities between 30 and 50 vol. % is necessary. I personally prefer the mixture of 300 ml of isopropanol (or denatured ethanol), 700 ml of water and 20 ml of liquid washing agent. Such liquid can be used down to -30 °C which is suitable for majority of us. If you will be using the car in environments where there are lower temperatures, the fraction of alcohol should be increased to, for instance, 400 ml of alcohol with 600 ml water, or even 500 ml alcohol and 500 ml water. The latter will freeze at around -50 °C.