

Bath Bombs and Alka Seltzer – Chemistry in Motion

Don Mercer
Associate Professor, Department of Food Science
University of Guelph

I've always had a fascination with chemical reactions that bubble and fizz. After all, that's what chemistry is really all about, right?

As kids, before the dawn of video games, we would use the reaction of vinegar (acetic acid) and baking soda (sodium bicarbonate) to blow the caps off empty milk bottles or partially inflate balloons. All of this depended on the production of carbon dioxide gas during the effervescent reaction that took place.

Now, we see an added degree of sophistication elevating this lowly chemical reaction to new heights of consumer appeal with “bath bombs”. While there is some controversy over the myriad ingredients incorporated into these “explosive” novelties, I simply want to focus on the chemistry of what happens when you lob a couple of these into your bath water. It's also rather fun to see a bit of chemistry in motion and to understand just what is going on.

Perhaps not surprisingly, bath bombs share a common background principle with the popular pain reliever, Alka-Seltzer which entered the marketplace in 1931 (Alka-Seltzer is a trademark of Bayer AG).

In the case of Alka-Seltzer tablets, precisely measured quantities of sodium bicarbonate and citric acid are formulated with the medical ingredient acetylsalicylic acid (“ASA” for short). When dropped into a glass of water, the citric acid and sodium bicarbonate are free to react with each other while the ASA just goes along for the ride, so to speak. The reaction products are water, sodium citrate, and, of course, copious amounts of carbon dioxide gas. What we see and hear is the reaction generating bubbles of the carbon dioxide gas. Consuming the foaming liquid along with the ASA and a small amount of unreacted sodium bicarbonate can relieve headaches, upset stomachs, and mild body pains.

On the other side of the spectrum, far from a pharmaceutical application, we have bath bombs. If you look at their ingredient lines, you will certainly spot citric acid and sodium bicarbonate that power the whole display of turbulence once they hit the water. In addition, there can be colours, fragrant oils, and even glitter or dried flower petals, as well as binding agents etc. Citric acid is a very mild acid that is found naturally in citrus fruits, or it can be manufactured in a powdered form through a number of fermentation processes. Because they are generally recognized as safe for food and other applications, citric acid and sodium bicarbonate are ideal for use in bath bombs.

In formulations for bath bombs that appear on-line, and in the case of Alka-Seltzer tablets, there is a consistent ratio of about twice the weight of baking soda (i.e., sodium bicarbonate) to the weight of citric acid powder. This is important from a chemistry perspective since it ensures that all the citric acid has been reacted, and that there is a small amount of extra sodium bicarbonate left over at the end of the reaction. In this way, you will end up with a little bit of baking soda in your bath water, which can have a soothing effect.

You may be surprised to see that water is an ingredient in many bath bombs. This water is used when mixing the non-reactive compounds. It is all tied up in the mixture and is not available to make the fizzing reaction occur. That reaction must wait until you drop the “bombs” into your bath water.

So enjoy your bath bombs, and perhaps some day, someone will invent one that works in the shower.



The Alka-Seltzer tablet (left) and bath bomb (right) both use baking soda and citric acid to create the bubbling effect.