



BATH BOMBARDIERING

Chemical Engineers also work in cosmetic industries, included alongside some of the wealthiest industries on Earth, well reflected in the salaries paid to them. The cosmetics industry in the EU was worth £67 billion in 2011, in 4000 companies and employing over 17000 scientists. A simple and effective way to bring together the concepts of the importance of a process development in handling chemistry is highlighted in the activity below.

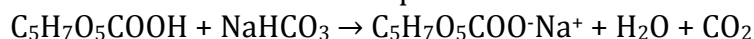
This activity will help you consider how chemicals react when you are designing a process that makes bath bombs. Get things in the wrong order and it starts to react before it's had a chance to dry out. Think through the reaction and mix them in the right order.

BOMB MAKING ACTIVITY

Equipment: Citric acid, sodium hydrogen carbonate, essential oils, water, disposable pastettes, small cardboard container (similar to McDonalds sauce pots), mixing spoon.

REACTION.

Citric acid and sodium hydrogen carbonate (bicarbonate of soda), when mixed with water will produce excess carbon dioxide.



MIXING THE REACTANTS DRY.

If the chemicals are mixed when dry then they will not bind together and the bath bomb will never set. So we have to add liquid.

ADDING WATER TO MIXED INGREDIENTS.

Very little liquid is required when working with small amounts of reactant. If too much water is added to the mixed reactants then there is a possibility that the chemicals will start to react instantly.

MIXING THE BICARBONATE WITH THE WATER FIRST.

This allows the amount of water to be added safely until the correct consistency is found. Essential oil fragrance and colouring may be added at this time as long as the consistency of powder remains.

ADD THE CITRIC ACID

This should be added at the end in a ratio of 2:1, bicarbonate to citric acid. Adding citric acid at this stage will prevent the 'almost dry' bicarbonate mixture from reacting when added. When the final mixture is placed in the cardboard pots, they will set overnight and be useable the following day.

FURTHER THOUGHTS

Ask students how they think this process may be scaled up. It is evident that only a small amount of liquid is required to dampen the bicarbonate. However, this is actually easier when scaled up for industry. While automation might seem to be a popular suggestion, it might be useful for students to see how they are made at Lush via their YouTube channel: <http://bit.ly/1c84cWo> where they will see it is largely handmade. Sometimes, developing the right process is enough and automation isn't as cost effective. What difference does adding a little cornflour make when added during the process? How do the cornflour starch chains hold onto water?

