

To investigate which is the most effective soap in preventing fogging of the spectacles

by: Alycia Valerie Ng Shi Ying, Charlene Tan Shi Jia, Joelle Lee Xin Hui and Rebecca Lee Shen

Abstract

An investigation was performed to find out which soap is most effective in preventing spectacles lenses from fogging. We use soaps that are commonly found at home, such as shampoo, dish soap, detergent, body soap and hand wash. When you are in a cold room, your spectacles would lose heat to the surrounding air. As you move to a room with a higher temperature, the water vapour in the surrounding air would lose heat to the spectacles and condense on the lenses. This will prevent the user from seeing clearly and is a hassle for the user to clean their spectacles. Through our research, we found out that soap prevents the fogging up of glasses. In our experiment, we applied a layer of soap to the spectacles and placed it in a fridge. After a while, we would take the spectacles out of the fridge and place it in a sealed box with a light source and a light sensor. The light sensor would detect the amount of light that passed through the glasses. The experiment was repeated using the five different soaps to find out which spectacle allowed more light to pass through after soap was applied on it. The more light passes through the spectacles, the more effective the soap is at preventing fog from forming. The results collected shows that body soap works the best as it allowed the most amount of light to pass through the spectacles.

Introduction

Our project is about investigating which soap is most effective in preventing the fogging of spectacles. This project was chosen to help spectacle users solve the problem they face: their spectacles fogging up when they move from a colder region to a hotter region. It is very troublesome for them to constantly clean their spectacles and they may be prone to accidents as they are unable to see properly when their glasses are fogged up. Based on our personal experiences, our glasses fog up when we exit the bus. Most of the time we will be carrying many items in our hands, so we will not be able to clean our glasses, causing us not to be able to see where we are going clearly. We have pondered about ways to de-fog our glasses but the 'solutions' we find are not of any help. This is because the solutions provided, which always consists of anti fogging wipes, are hard to obtain. Thus, we want to find a solution that is easily obtainable and can be found at home. Through our research, we found out that soap can be used to prevent fogging of glasses. We hope to help spectacle users find a easy and convenient solution to this problem.

Theoretical background

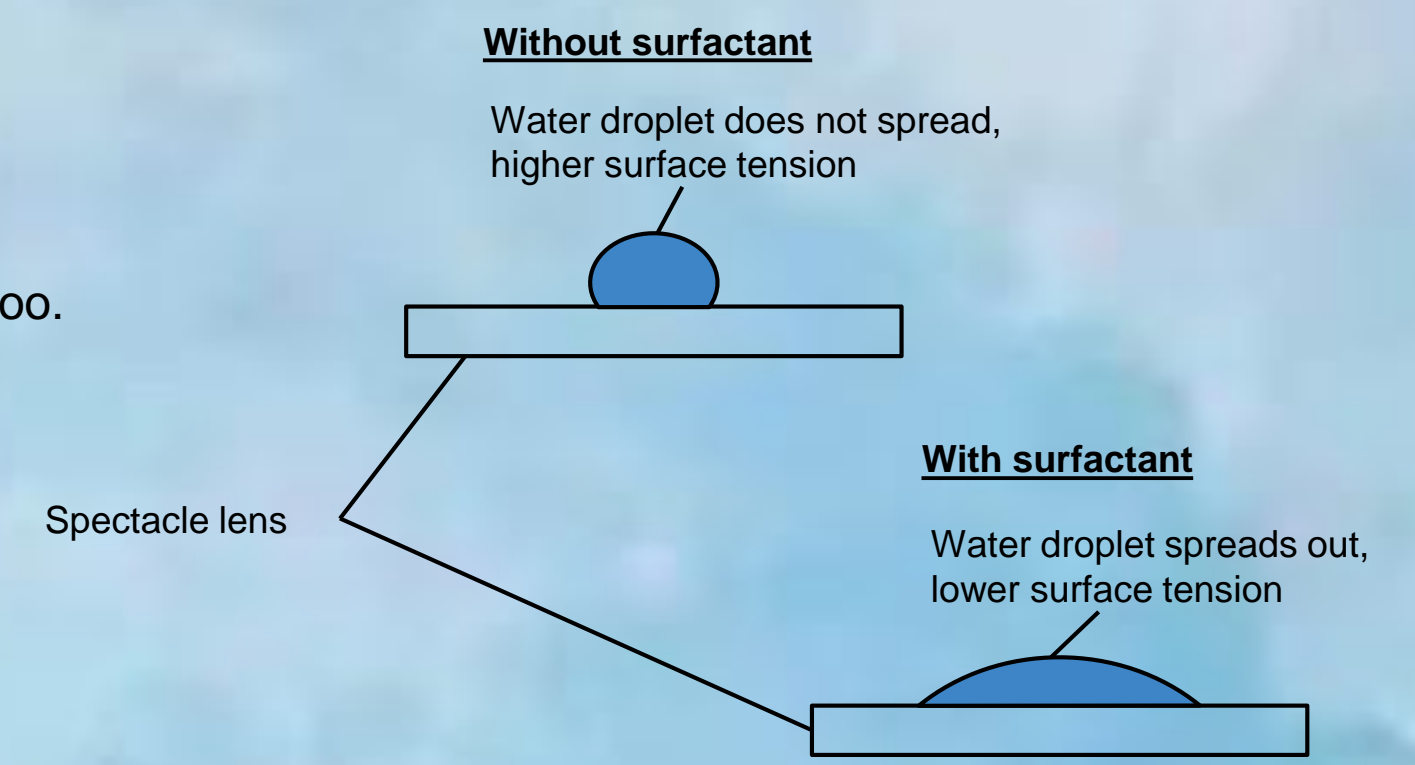
The spectacles fog up because the water vapour in the surrounding air is at a higher temperature than that of the temperature of the spectacle lenses. This causes the water vapour to lose heat to the lenses and condense on the lens, forming small water droplets. Your glasses are either convex or concave lens which will help to correct the refraction of light onto you retina to help you to see. When fog is formed, small droplets of water that are formed on the lens cause diffused reflection to occur as the water droplets formed an uneven reflective surface. This causes us not to be able to see clearly. The soap is able to prevent the glasses from fogging up because of its hydrophilic and hydrophobic heads. The hydrophobic head does not like water while the hydrophilic head is water-loving. The hydrophobic head, which has similar properties as a lipophilic head, will be attracted to the glasses. On the other hand, the hydrophilic head will be attracted to the water droplets. This will cause the water droplets to be separated and be absorbed into the hydrophilic layer, eliminating fogging. The soap also has a surfactant effect which is caused by the surfactants in the soap. This effect causes the water droplets to be absorbed into the layer of hydrophilic layer and to be spread out to form a thin film of water. This film of water does not affect your vision as the water droplets are too small to be visible.

Materials :

- 2 spatulas of Essence Detergent
- 2 spatulas of Mama Lemon Dish Soap
- 2 spatulas Kirei Kirei Hand Wash
- 2 spatulas of Johnson's Baby Body Wash
- 2 spatulas of Essential Shampoo
- 4 identical spectacles with no degree lenses
- Tap water
- Toilet paper
- Spatula
- Stopwatch
- Cardboard box
- AES light source kit
- Light sensor
- Datalogger
- Fridge

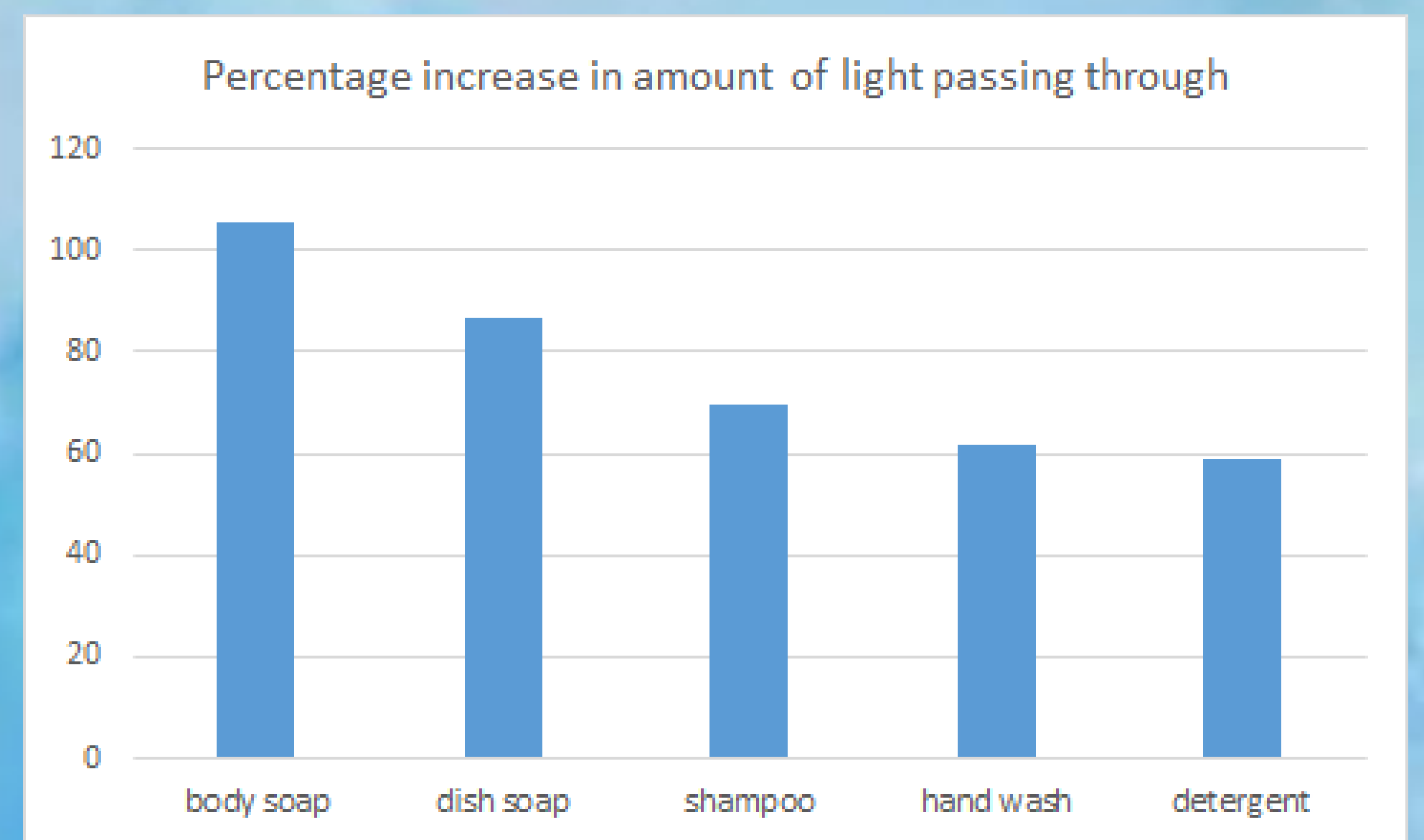
Procedure :

1. Apply 1 spatula of detergent onto each side of the lens.
2. Spread the detergent with the spatula so that the entire lens is covered with detergent.
3. Leave the spectacles to dry for 10 minutes.
4. Wipe the detergent off both sides of the lens after 30 seconds.
5. Put the spectacles in the fridge for 2 minutes.
6. After 2 minutes, remove the spectacles from the fridge.
7. Record the amount of light that passes through the lenses.
8. Set the spectacles aside for 10 minutes.
9. Repeat steps 5 to 8 four more times (do the experiment 5 times in total)
10. Repeat steps 1 to 9 for the dish soap, hand wash, body wash and shampoo.
11. Repeat steps 5 to 9 for the control setup (no soap is applied).



Results

Amount of light that passes through the glasses (lux)	First reading	Second reading	Third reading	Fourth reading	Fifth reading	Average	% increase in amount of light passing through (to 1d.p)
Control without soap	110	134	140	145	149	135.60	-
Body soap (Johnson's Baby)	296	299	265	255	278	278.60	105.5
Dish Soap (Mama Lemon)	287	270	238	241	230	253.20	86.7
Shampoo (Essentials)	267	157	220	220	285	229.80	69.5
Hand Wash (Kirei Kirei)	223	163	191	191	203	219.00	61.5
Detergent (for hand washing clothes) (Essence)	247	284	191	169	188	215.80	59.1



Discussion and Conclusion

The more the amount of light recorded, the more effective the soap is in preventing fog from forming. We analysed the data collected and compared all the averages of all the different soaps with the control set-up in order to find out which was the most effective. Based on the results, we found out that body soap is most effective in preventing the fogging of the spectacles as it allowed the most amount of light to pass through. When we were comparing the different ingredients in the different soaps, we found out that only body soap has lauryl glucoside which is a type of surfactant. Lauryl glucoside is a lipid-based surfactant which is organic. This surfactant, which is high in lipid, is present in baby soap in order to get the strong fragrant smell, which requires a large amount of oil when making it. The lipid in the surfactant will form a layer of oil on the spectacles. As water and oil do not mix, the water will be repelled and spread out by the surfactant. The lipophilic head in the surfactant - lauryl glucoside is what makes the body soap most effective in preventing fog from forming. From the results, we also noticed that the second best soap was dish soap. Although we were unable to find any information on this particular soap, we predict that this soap was the second most effective as dish soap is used to wash utensils and dishes. These dishes and utensils would tend to be oily from the food that we eat. The dish soap would therefore contain surfactants with stronger hydrophilic and lipophilic heads to remove the grease and oil from the plate. Shampoo, hand wash and detergent are weaker soaps as they come into contact with our hands which may be harmful for us if the soap is too strong. Hence, the surfactant effect would also be weaker, causing more fog to form. The shampoo, hand wash and detergent may also not be so effective in preventing fog as it does not have lauryl glucoside which is a surfactant that helps prevent fogging. In conclusion, body soap is most effective in preventing fog from forming. This is a much more convenient and cheaper alternative compared to buying anti-fogging wipes or solutions to prevent your glasses from fogging up and having to go through the hassle of having to clean your spectacles every time they fog up. Further possible investigations to follow-up are to find out how long the effect can last so that you will know when you need to reapply the soap. Another possible investigation is to find out how much soap to use so that you can have an optimum effect for a prolonged period of time.

References

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