

**Protect hair with oil  
made from food waste**

## Motive

- be interested in hair
- solve the problem of food waste



## Question

**If oil made from food waste  
is effective as hair oil?**

## Selection of parts

**avocado**

**skin**



**seed**



**fruit**



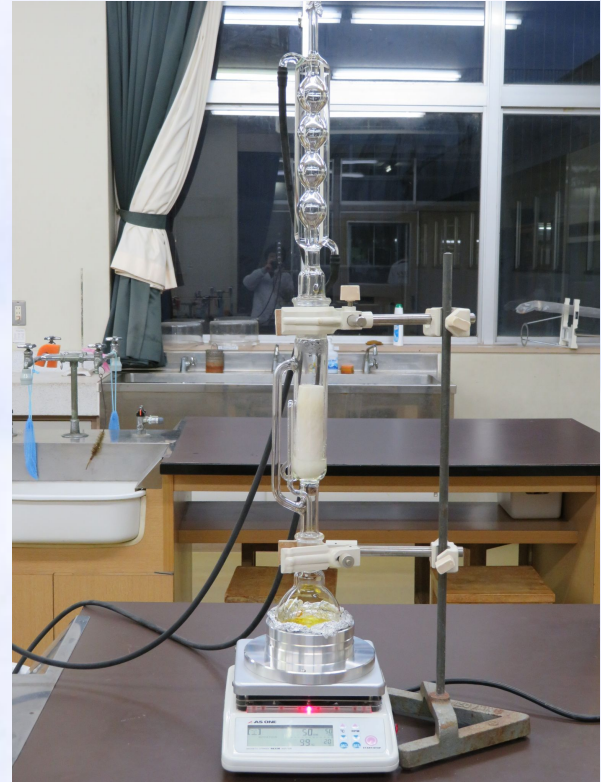
**orange**

**skin**



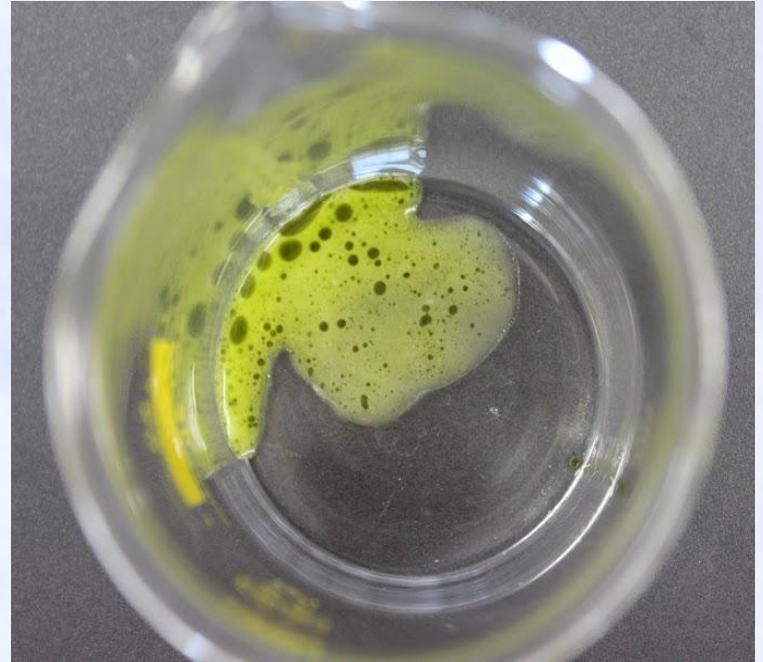
# How to make orange oil

1. put in **hexane**
2. **extract** oil with soxhlet extractor
3. **remove the needless liquid** with an evaporator



# How to make avocado oil

1. **cut** up avocado fruit
2. **heat** until the water is gone
3. wrap in cloth and **squeeze**



# Judge of the extracted substance

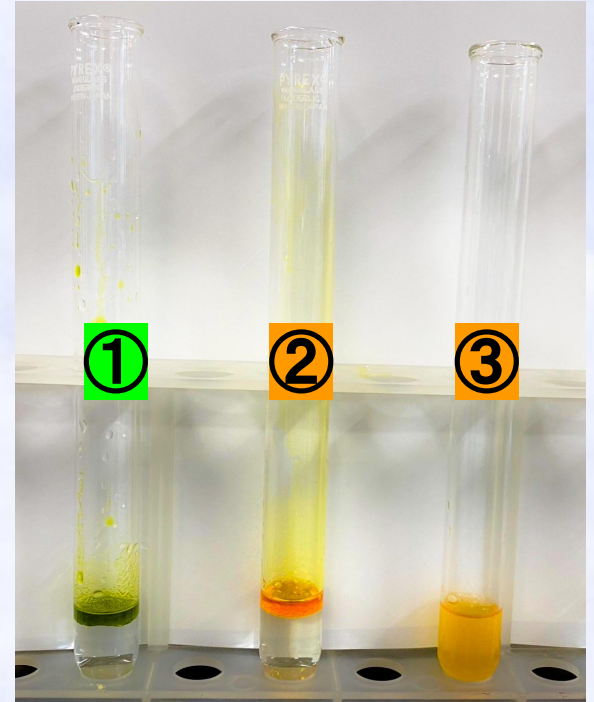
method: put water and the extracted substance in test tubes

result: **avocad oil and orange oil separated** from water

① **avocad oil**

② **orange oil[hexane]**

③ **orange oil[ethanol]**





# How to observe hair

- desktop electron microscope



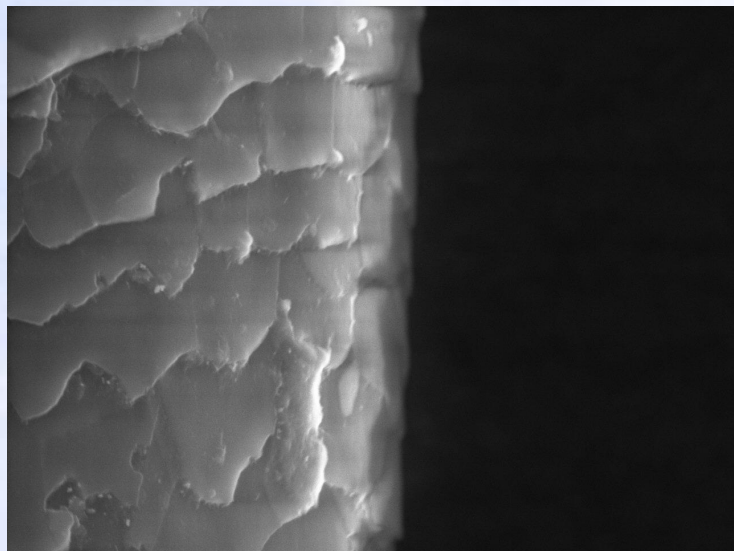


## Select of hair

- natural hair
- bleached
- root

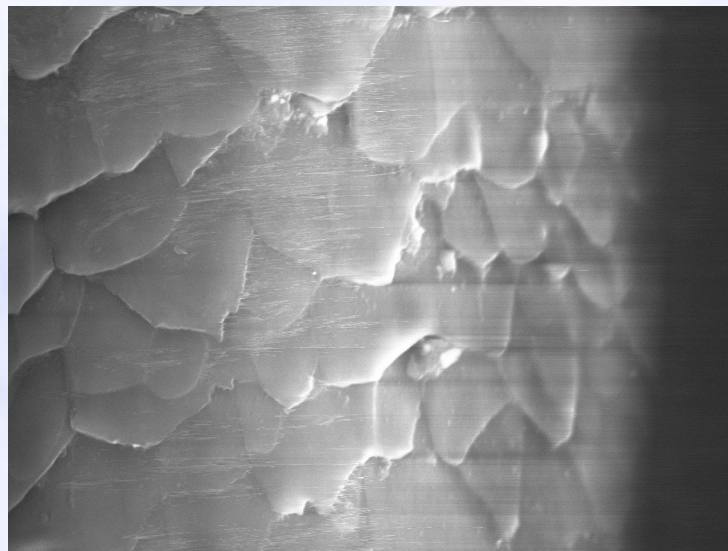


# Result of avocado oil



Miniscope0549 2022/12/22 10:00 HMMD4.5 x3.0k 30 μm

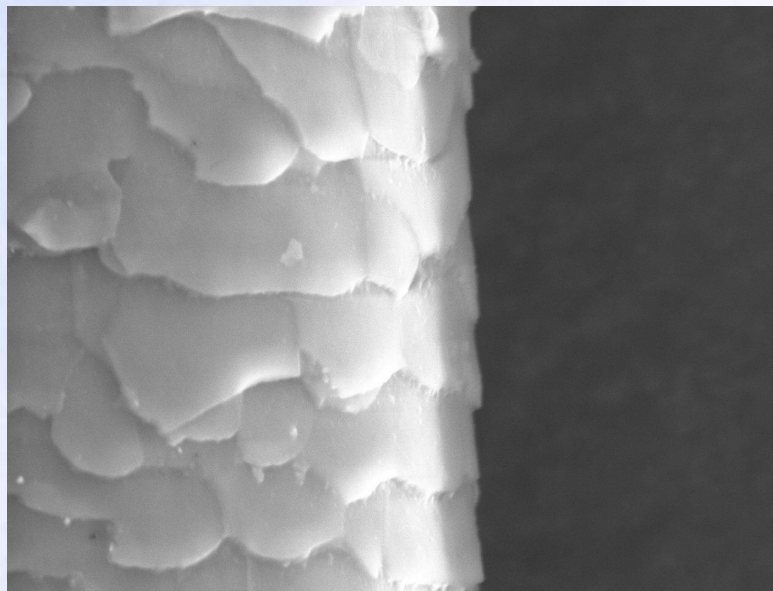
normal



Miniscope0551 2022/12/22 10:17 HMMD4.5 x3.0k 30 μm

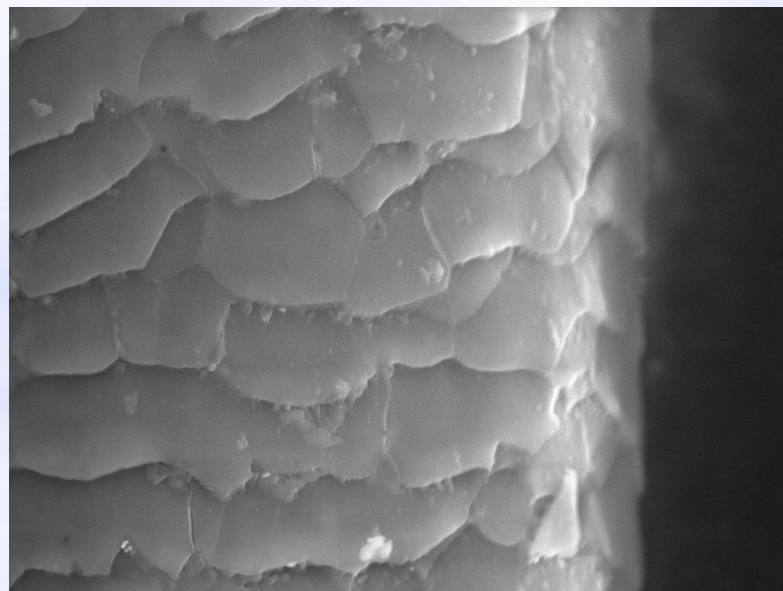
with avocado oil

# Result of orange oil



Miniscope0561 2022/12/22 11:22 HMMD4.5 x3.0k 30 μm

normal



Miniscope0567 2022/12/22 11:54 HMMD4.5 x3.0k 30 μm

with orange oil

# Change in observation method

**not affect cuticles**



examine

- Appearance
- Sense of touch
- Smell



The image displays three vertical bundles of dark hair against a white background. Each bundle is labeled with a colored box containing text. The leftmost bundle is labeled 'Avocado' in a green box. The middle bundle is labeled 'Orange' in an orange box. The rightmost bundle is labeled 'normal' in a yellow box. The hair in the 'Avocado' bundle appears slightly more frayed and less uniform than the other two. The 'Orange' and 'normal' bundles appear smoother and more uniform in color and texture.

Avocado

Orange

normal

## Practical use of avocado oil

- Appearance                    sticky and oily
- Sense of touch                sticky and oily
- Smell                             cannot feel

## Practical use of orange oil

- Appearance      smooth and silky
- Sense of touch      smooth and silky
- Smell      smell of orange



## Summary

No effect on cuticles

Effect on appearance

## Conclusion

Oil of avocado fruit

wetness and bundle

Oil of orange skin

smoothness and unity

## Future prospects

- add **nutrients** to oil
- examine **heat resistance**
- experiment with **other types** of oil

# References

【about microscope】

<https://chem-fac.com/vacuum/>

【Amount of oil applied to hair】

<https://chouchou-shop.jp/media/hairoil-too-much>

【the picture of microscope】

<https://www.hitachi-hightech.com/jp/sinews/technology/5053/>

【the picture of 】

<https://tshop.r10s.jp/zm-mart/cabinet/07781276/ldl057-20.jpg?fitin=720%3A720>

# cooperationer

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