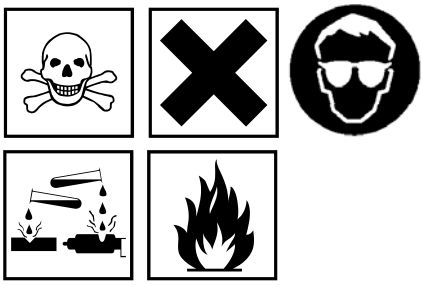
Comparing the degree of unsaturation of margarine with that of butter



Aims

To discover which is more saturated, margarine or butter.

Theory

Unsaturated fatty acids in the oils and fats of margarine and butter will decolourise bromine water. The reaction is quantitative – 1 mole of C=C bonds will react with 1 mole of bromine, Br_2, and will self-indicate during a titration. At low concentrations of bromine in water a number of species are present, but at high concentrations most of the bromine is present as molecular bromine. Care must be taken when handling such a solution. However, once in a burette, the surface area of bromine water exposed is very small compared to its volume and, provided there is adequate ventilation, there is relatively little hazard. The fats and oils in margarine and butter are not miscible with bromine water, but they *will* decolourise it if sufficiently vigorous shaking is used during titrations.

Apparatus

goggles
bench mat
tripod
gauze
Bunsen burner
stand, bosses, clamps
50cm^3 burette
250cm^3 conical flask
25cm^3 transfer pipette
pipette filler
spatula
white tile
plastic funnel
teat pipettes
0.0625M bromine water
digital balance
fume cupboard
detergent
propanone
sodium thiosulphate solution

Methods

1. Weigh accurately about 0.5g of margarine into the conical flask. Record *all* your weighings.
2. Gently **warm** the margarine to melt it, then add 25cm^3 of water whilst shaking the flask to disperse the margarine.
3. Set up and clean the burette in the usual way. Fill the burette with 0.0625M bromine water **in the fume cupboard**, run down to the 0.00cm^3 mark, then return the burette to your bench.
4. Titrate using bromine water, making sure that you record *all* your measurements correctly.
   It is most important that you shake the contents of the conical flask vigorously while titrating, and that you do not add the bromine water too quickly. The end-point occurs when the margarine sample just fails to decolourise the bromine water.
5. Repeat steps 1 - 4 with a sample of butter. If time, do replicate experiments.

   Note: The conical flask must be scrupulously cleaned between experiments: use a small quantity of detergent and warm water, followed by a rinse in de-ionised water, then in a small volume of propanone. Allow it to air-dry in the fume cupboard.

Bromine water: Bromine water is corrosive and toxic. In case of spills, immediately add 1M sodium thiosulphate solution and seek help.

Saturation of Butter and Margarine Collected Results

Margarine	
Mass (g)	Titre (cm^3)
0.50	36.90
0.58	39.60
0.39	30.65
0.61	39.60
0.51	26.90
0.58	32.25
0.57	34.30
0.56	31.30

Butter	
Mass (g)	Titre (cm^3)
0.54	18.90
0.52	11.90
0.52	14.20
0.47	15.75
0.58	13.65
0.65	14.90
0.63	15.10
0.57	17.65
0.60	17.48

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Technician's Notes

Per student

goggles
bench mat
tripod
gauze
Bunsen burner
burette holder
50cm^3 burette
250cm^3 conical flask
25cm^3 bulb pipette
pipette filler
spatula
white tile
plastic funnel
teat pipettes

Reagents

de-ionised water
0.0625M bromine water* (2.5cm^3 bromine in 1 litre of de-ionised water)
1M sodium thiosulphate solution (approximate concentration only - for use in bromine spills)
detergent
propanone* (allow about 250cm^3)
margarine
butter

Access to

top-pan balance
fume cupboard

Health and Safety Notes

Bromine

Bromine water: Bromine water is corrosive and toxic.
In case of spills, immediately add 1M sodium thiosulphate solution.

Propanone

