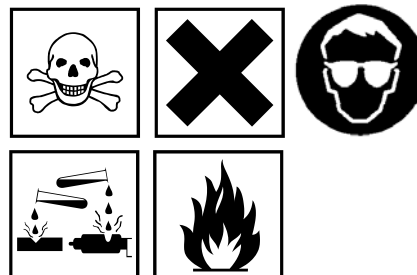


Comparing the degree of unsaturation of margarine with that of butter

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, Br₂, 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	250cm ³ conical flask	0.0625M bromine water  
bench mat	25cm ³ transfer pipette	digital balance
tripod	pipette filler	fume cupboard
gauze	spatula	detergent
Bunsen burner	white tile	propanone 
stand, bosses, clamps	plastic funnel	sodium thiosulphate solution 
50cm ³ burette	teat pipettes	

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 25cm³ 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 0.00cm³ 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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To compare the degree of unsaturation of margarine with that of butter

Technician's Notes

Per student

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

Reagents

de-ionised water
0.0625M bromine water* (2.5cm³ bromine in 1 litre of de-ionised water)
1M sodium thiosulphate solution (approximate concentration only - for use in bromine spills)
detergent
propanone* (allow about 250cm³)
margarine
butter

Access to

top-pan balance
fume cupboard

Health and Safety Notes

Bromine

Bromine water: Bromine water is corrosive and toxic.
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Propanone