

Food additives

- increased food quality
- legislation
- **prolonging shelf life**
 - food preservatives
 - antioxidants
- **adjusting aroma and taste**
 - fragrant and taste compounds
 - alternative sweeteners
 - acidulants and regulator of acidity
 - bitter compounds and stimulating compounds
 - aroma intensifiers

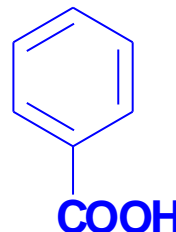
- **compound adjusting colour**
 - colours
 - bleaching agents
- **compound adjusting texture**
 - thickening and gelatinous agents
 - emulsifiers
- **compounds enhancing biological value**
 - (nutritional factors, biological supplement)
 - vitamins
 - minerals
 - nutraceuticals**
- **other additives**

food preservatives

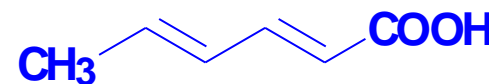
antimicrobial substances prolong shelf life of foods

acids and their derivatives

benzoic acid, benzoates (salts)

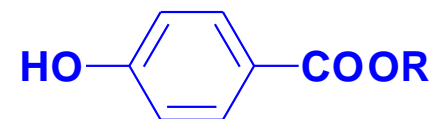


- sorbic acid, (2E,4E)-2,4-hexadienoic acid, and its salts



- parabens (alkyl esters of p-hydroxybenzoic acid)

R=Me, Et, Pr, Hp



- other acids

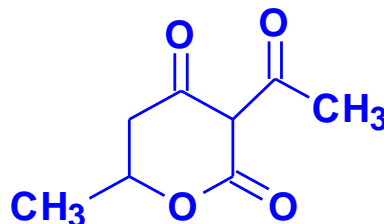
formic

acetic

propionic

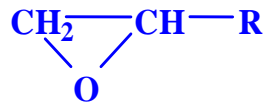
lactic

fumaric and other



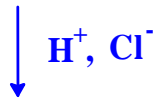
some are classified as acidulantes

alkylenoxides



oxirane, R=H

methyloxirane, R=CH₃

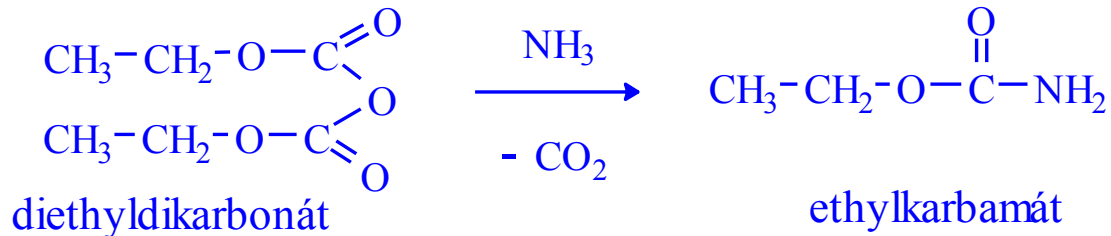


2-chloroethanol, R=H

2-chloropropan-1-ol, R=CH₃

1-chloropropan-2-ol, R=CH₃

dialkyldicarbonates



dimethylester (E242) is permitted for wine treatment

antibiotics

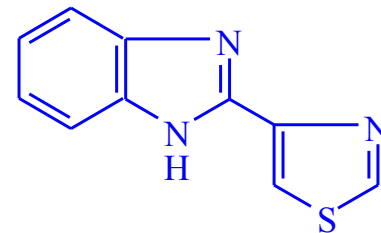
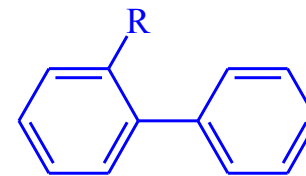
- mostly bacteriocins (lactic acid bacteria)
 nisin (polypeptide),
 (*Streptococcus lactis*),
natamycin (pimaricin, macrolide)
(*S. lactis*, *Streptomyces natalensis*)

enzymes

lysozyme (activity of neuramidase)

fungicides

biphenyl (R=H),
o-phenylphenol (biphenylol), (R=OH),
thiabendazole



inorganic compounds

sulfur dioxide, sulfites

nitrites

boric acid, boritans

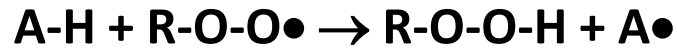
NaCl

natural compounds with anti-microbiologically activity

Compound	Effect of preservation		
	Bacteria	Yeasts	Moulds
benzoic acid	++	+++	+++
esters of 4-hydroxybenzoic acid	++	+++	+++
sorbic acid	+	+++	+++
SO ₂	++	+	+

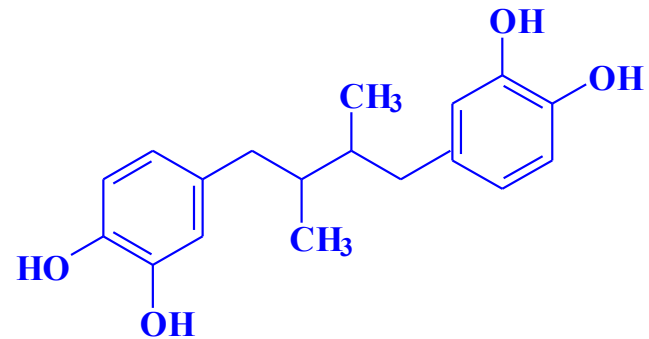
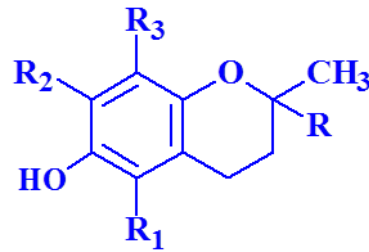
antioxidants

mechanism of activity of primary antioxidants



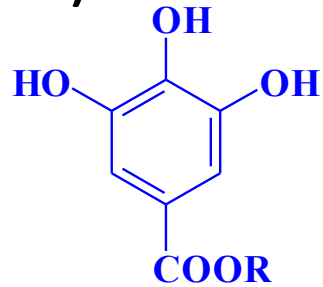
natural

- tocopherols
- NDGA (nordihydroguaiaretic acid)
- ascorbic acid and its derivatives
- phenolic acids esters, flavonoids, spice extracts

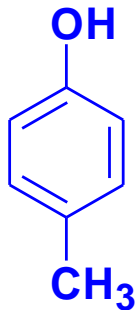


synthetic

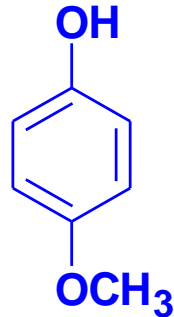
- gallates (polar)



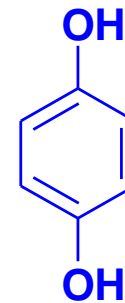
- phenols (non-polar)



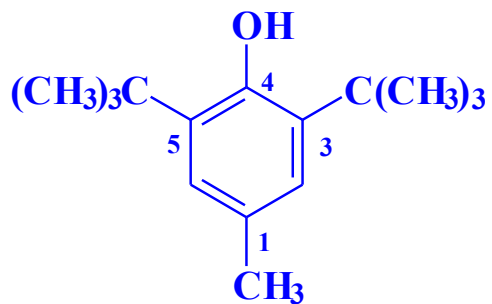
4-hydroxytoluene



anisole

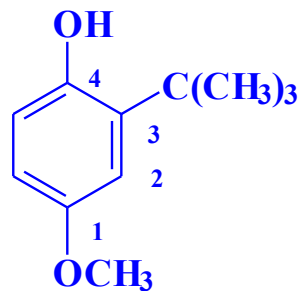


hydroquinone



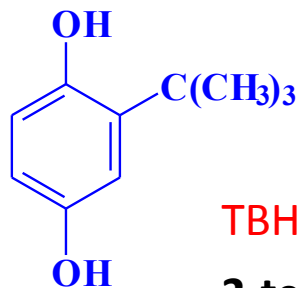
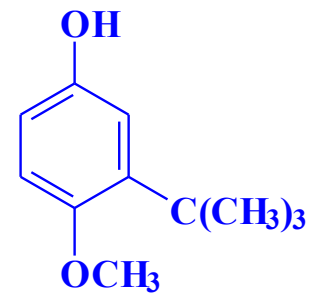
BHT

3,5-di-tert. butyl-4-hydroxytoluene



BHA

2- or 3-tert. butyl-4-hydroxyanisole



TBHQ

2-tert. butyl-1,4-hydroquinone

polar

gallates

for pure fats

unpolar

phenols

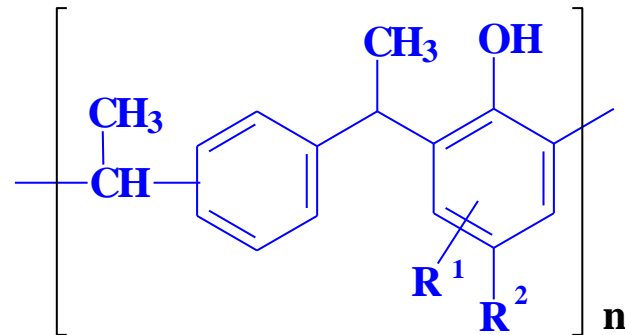
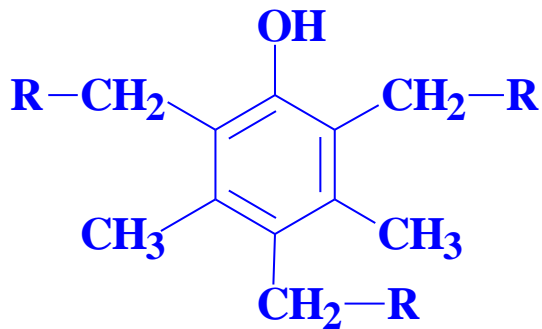
for emulsions (margarine)

nonvolatile

for long-lasting industrial frying

non resorbed

for diets



R¹ = OH or OCH₃

R² = H or alkyl

carry through effect

fragrant and gustatory compounds (aroma compounds)

origin of fragrant compounds

75% natural

25% synthetic – 99% in nature

1% does not occur in nature

materials oleoresins
 extracts, juices, pulps, distillates
 essential oils
 - absolute
 - deterpenated

reconstituted

fresh parts of plants

dried or in other way adjusted parts of plants = **drugs**

alternative sweeteners

- **natural** (thaumatin, stevioside)
- **synthetic identical with natural compounds or modified natural compounds** (sugar alcohols, neohesperidindihydrochalkon)
- **synthetic** (saccharin)
- **nutritive** (aspartam, monellin) **10 kJ (2.4 kcal)/g**
- **non-nutritive** (rest of sweeteners)

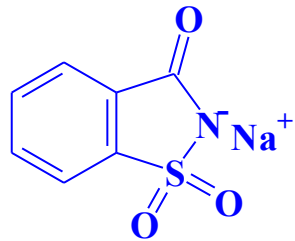
according to legislation

monosaccharides

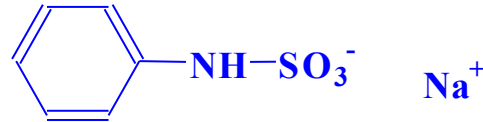
disaccharides

sugar alcohols are not additives

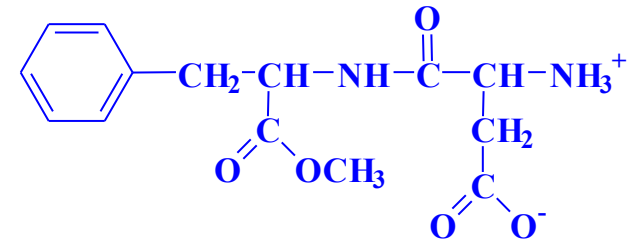
synthetic non-nutritive sweeteners



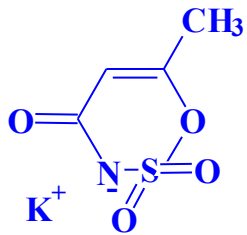
saccharin



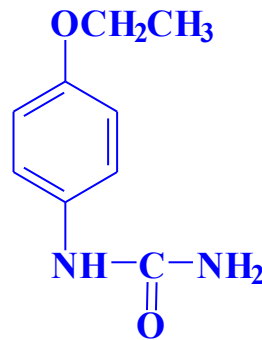
cyclamate



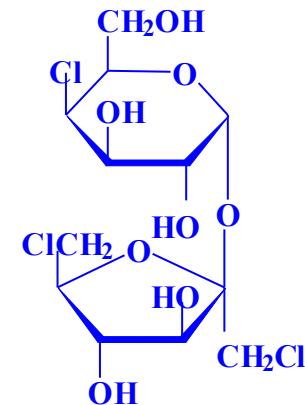
aspartame (USAL)



acesulfame K



dulcin



sucralose

sweet proteins

monellin (*Dioscoreophyllum cummuisii*, tropical tree)

thaumatin (*Thaumatococcus danielli*, tropical tree)

sweet peptides

miraculin (*Richardella dulcificum*, tropical tree)

acidic taste  sweet taste

sweetness

sucrose	1.0
lactose	0.25
glucose, sorbitol, glycerol	0.5
cyclamate	30
glycyrrhizin	50
aspartam	150
dulcin (4-Ethoxyphenyl)urea	150-250
stevioside	300
saccharin	240-350
neohesperidin dihydrochalcone	1000
osladin	3000

acidulants and acidity regulators

- acids

 - acid taste and other properties

 - antimicrobial effects (**propionic acid, acetic acids and other acids**)

 - different taste possibly aroma (**succinic acid, acetic acid and other acids**)

 - stabilisers of colours (**ascorbic acid, citric acid**)

 - sequestrants (**ascorbic acid, citric acid, EDTA, H₃PO₄**) and other acids

 - influence on texture (**citric acid**)

 - suppression of turbidity formation (**lactic acid**)

- acids derivatives

 - salts (carbonates \longrightarrow CO₂)

 - lactones (δ -gluconolactone)

- salts with buffer activity, alkali

 - increase of meat water-holding capacity

 - melting salts in cheese technology

 - olive debittering

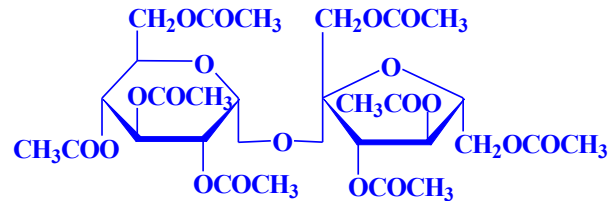
 - fruits and vegetables peeling

bitter and stimulating compounds

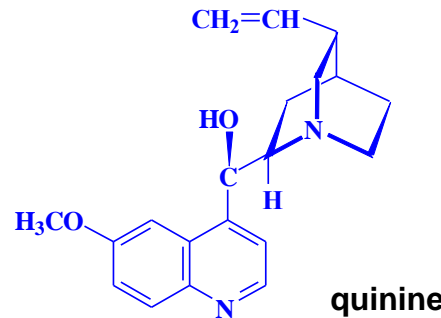
organic and inorganic compounds

additives

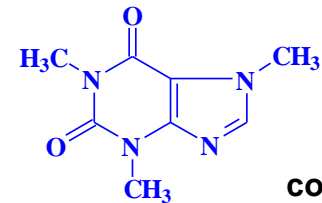
- octaacetylsaccharose
- coffeine
- quinine



octaacetylsaccharose



quinine



coffeine

other plant compounds, hops, wormwood: belong to **fragrant and taste**

compounds (aroma) compounds

non alcoholic drinks

75 mg/l

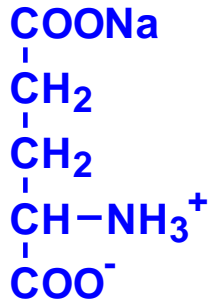
250 mg/l

alcoholic drinks

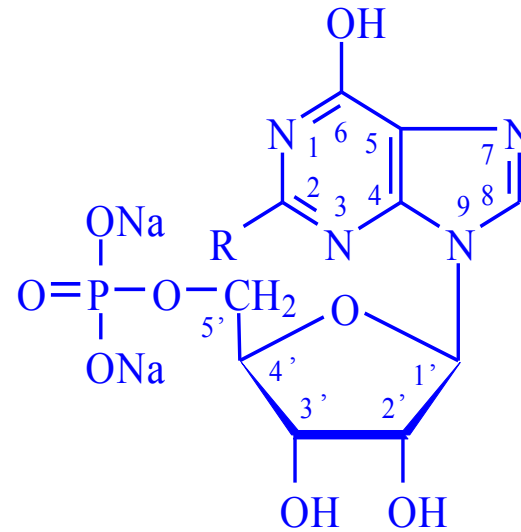
300 mg/l

necessary amount

aroma intensificators



natrium-hydrogen glutamate
(UMAMI)

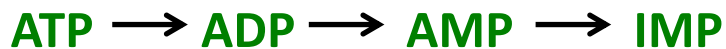


5'-ribonucleotides

R=H IMP inosinic acid (disodium inosinate E631)

R=NH₂ GMP guanylic acid (disodium guanylate E627)

post mortem



pork meat:

230 mg/kg Glu
1860 mg/kg IMP
37 mg/kg GMP

substances modifying colour

- natural pigments

riboflavin

carotenoids

β -carotene

β -apo-8'-carotenal

canthaxanthin

bixin

crocetin

curcumin

betacyans

carmine (cochineal)

chlorophyllide - Cu (II)

caramel

- natural-identical synthetic pigments

- synthetic dyes

soluble in water 17 CZ

soluble in fat 0 CZ, 9 USA

monoazo dyes

diazo dyes

indigo dyes

xanthene dyes

diaminotriphenylmethane dyes

Amaranth (Victoriarubin)

Yellow SY

Tartrazine (yellow)

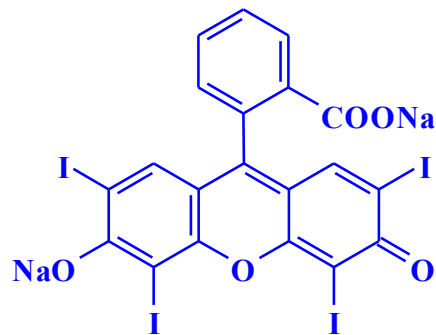
Ponceau 4R (cochineal red)

Brilant black

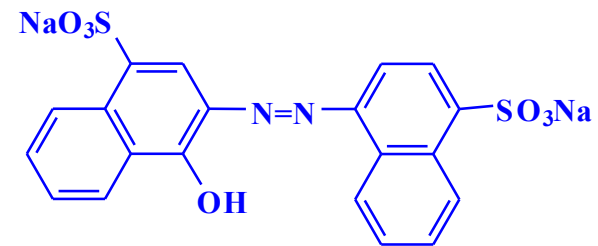
Indigotine (blue)

Erythrosine (red), contains iodine

Patent blue



erythrosine

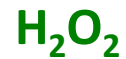


azorubine

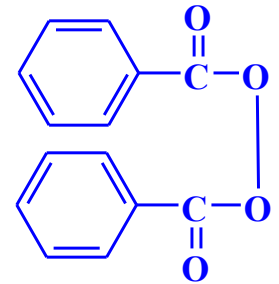
bleaching agents

coloured $\xrightarrow{\text{oxidation or reduction}}$ **colourless**

- oxidative agents (with active oxygen or chlorine)



dibenzoylperoxid



- reduction agents



thickening, jellying and swelling agents, binders, fillers

consistency, texture

- **natural**

 - plant polysaccharides (pectin)

 - algal polysaccharides (agar, alginate, carrageenans)

 - plant gums (Arabic, tragant)

 - proteins (gelatin)

- **natural modified**

 - polysaccharides (starch, cellulose)

modified cellulose

- **hydrolysed** microcrystalline cellulose

 - parcial hydrolysis by HCl, fibre, low-energy fillers, aroma carrier

- **derivatised**

- ethers**

- carboxymethylcellulose (Na salt)**

- methylcellulose**

- hydroxypropylcellulose**

- thickening, stabilisers of emulsions, ice decelerators**

- modified starches**

- **transformed (converted, degraded)**
- **polymerised**
- **stabilised**
- **modified by other means**

emulsifiers

hydrophobic part

hydrophylic part (anion, cation, amphoteric)

non-ionogenic

ionogenic (anion-active, cation-active)

HLB

non-polar = 1

polar = 20

natural

phospholipids (lecithin)

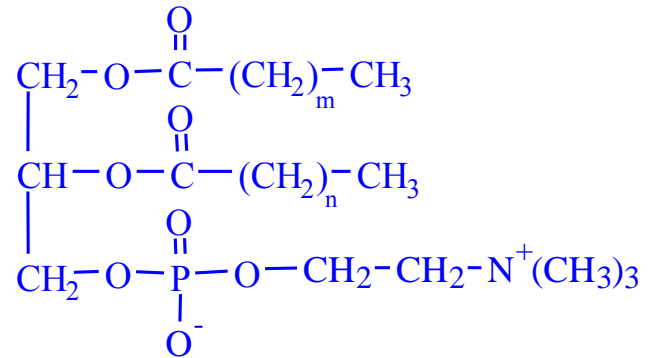
ionogenic



Cholin (main compound)

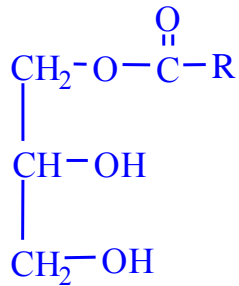
monoacylglycerols

non-ionogenic

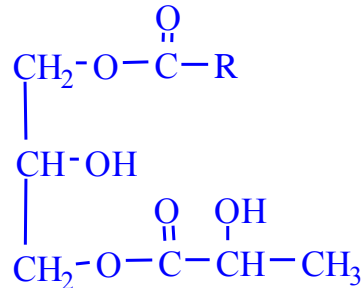


synthetic

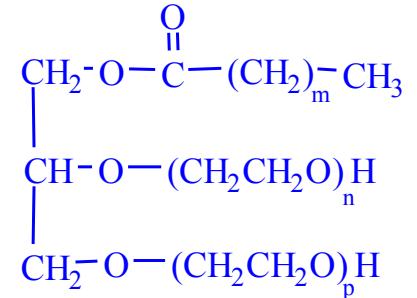
glycerol esters and their derivatives (polyglycerols)



monoacylglycerol

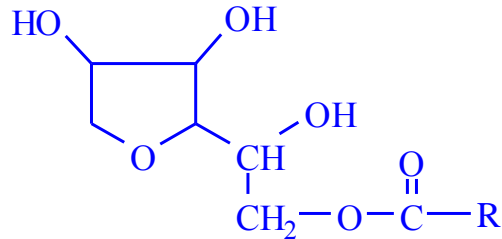


esters with lactic acid

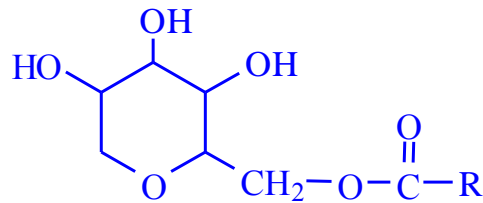


ethers with ethylenoxide

sorbitan esters



1,4-sorbitan ester

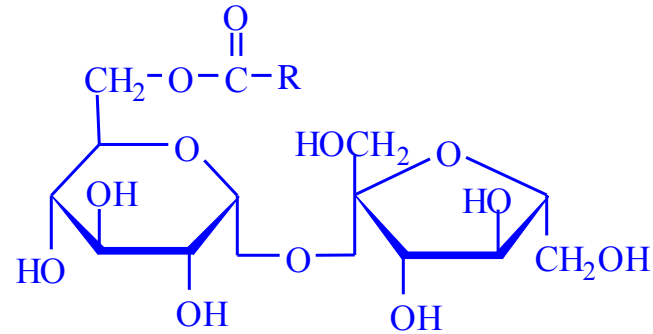


1,5-sorbitan ester

Span

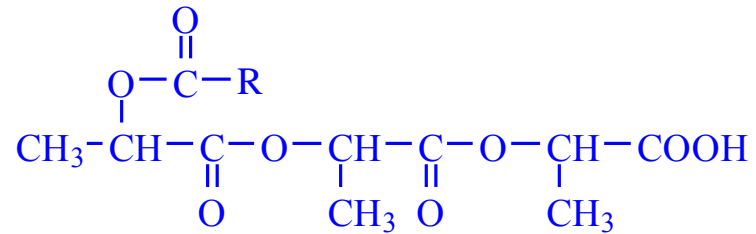
Tween

saccharose esters



saccharose monoester

hydroxyacids esters



6-monoester of lactic acid trimer

other additives

- **firming**
cell walls, fruits and vegetables (CaCl_2)
- **enable formulation of products**
carriers of aroma compounds (starch, dextrans, cyclodextrins)
fillers (polysaccharides)
adhesive compounds (starch, dextrans, phosphates)
surface modification agents (waxes)
softening agents (monoacylglycerols, oils)

- **auxiliary agents**

- antisintering agent (SiO_2)

- catalysts (Ni, MeONa)

- clarifiers (gelatin, tannin, polyvinylpolypyrrolidone)

- turbidity forming agents (gums, oils/Br, citrus peels)

- dispersion stabilisers (Arabic gum)

- foaming agents (surface active compounds, NO, saponins)

- defoaming agents (surface active compounds)

- lubricants and releasing agents (starch, MgSiO_4)

- sequestrants (chelating agents)

- packaging gasses

- **synergists and potentiators**

- **propelants**

- **solvents**