

School of Chemistry

Aims and Objectives: Session 2022-2023

Module CH4615: Fragrance, Food and Colour Chemistry

Duration: 20 hours

Lecturers: Dr R. A. Aitken and Professor R. J. M. Goss*

(*Module Convenor)

Aims: The module will examine three separate areas in which applied organic chemistry is important to society and industry: the development of fragrance and food flavour chemistry and the perfumery industry, selected chemistry of food components including their biosynthesis and health effects, and chemistry of coloured compounds including formation of natural and synthetic colours, their application to fabrics and uses in biochemistry.

Objectives:

1. Know the historical development of flavour and fragrance chemistry; the extraction of 'essential oils'. General requirements for a fragrance chemical in terms of molecular weight and functionality. Economics of extraction from natural sources vs. semi-synthetic and synthetic approaches. The concept of 'nature identical' materials and analytical methods to detect fraud.
2. Know the most important monoterpenes, their structures and interconversion. Synthetic routes used industrially. Sesquiterpenes and other less volatile fragrance compounds. Historical development of perfumes.
3. Know the fragrance compounds of animal origin: ambergris, musk and civet. Synthesis of the natural compounds and synthetic analogues – the nitro musks. Animal odour compounds for defence - the skunk.
4. Understand the use of food flavours and the link to fragrance. Aroma compounds from spices and fruits - aromatic compounds such as piperine, eugenol, vanillin, cinnamaldehyde, piperonal and coumarin; fruit flavours including aliphatic esters, raspberry ketone and strawberry furanone.
5. Know the structure and use of meat-like flavours - substituted thiazoles and pyrazines. Aroma constituents of coffee, bread and the garlic and onion family.
6. Gain an overview of the history of the chemistry of colour and dyeing and its impact on societies and economies.
7. Understand the physical and organic chemistry behind the way in which molecules interact with the UV/Vis spectrum.
8. Know the chemical composition and properties of the major natural materials including paper, cotton, wool and silk. Develop an awareness of bioinspired polymers, and polymers that mimic natural materials and a knowledge of the monomers and polymers, their functional group decoration and how these may bind to pigments.

9. Understand the general biosynthetic principles behind the generation of highly coloured aromatic polyketides. Anthraquinones, hydroxyanthraquinones, actinorhodin, naphthoquinones and azaphilone. The current and potential uses of these pigments.
10. Know about riboflavin and carotenoids, their biosynthesis and uses.
11. Know about dyes and chromophores for chemical biology.
12. Know about coumarin and anthranilates and indole containing/derived compounds. Indigo (natural and synthetic), Tyrian purple. The historical importance of these compounds and their biosynthesis. Important analogues, bioinspired and man-made dyes to include phthalocyanines and azo dyes.
13. Gain an appreciation of some of the natural chromophores and additives used to enhance food colour.
14. Know some of the main chemical constituents of food (carbohydrates, lipids, vitamins, protein, minerals etc.) their chemical properties and biosynthesis of some of these metabolites, including some important secondary metabolites.
15. Know about some of the toxins associated with foods and those derived from mushrooms.