School of Chemistry

Aims and Objectives: Session 2022-2023

Module CH5613: Reactive Intermediates

Duration: 20 hours

Lecturer: Dr R. A. Aitken* and Dr I. A. Smellie

Aims: To develop a broad understanding of the chemistry of key types of reactive intermediates including carbenes, nitrenes, arynes, carbocations and radicals. To understand how they can be generated, detected and characterised. To review how each type of reactive intermediate can be used in the synthesis of organic compounds including natural products.

Objectives:

1. To introduce general and specific methods for generating and detecting each type of reactive intermediate.

2. To study the most important reactions of carbenes and nitrenes i.e. insertion, cycloaddition and rearrangement.

3. To review inter- and intra-molecular reactions of arynes with nucleophiles and in cycloadditions.

4. To understand the use of flash vacuum pyrolysis in the generation of reactive intermediates in the gas phase.

5. To understand contemporary applications of carbenes, nitrenes and arynes and carbocations in synthesis.

6. To review the key reactions of carbocations.

7. To understand the key reactions of free radicals i.e. chain reactions incorporating addition, abstraction, electron transfer, rearrangement, cyclisation, homolytic substitution and termination steps. To review annulation and ring enlargement processes.

8. To review cascade reactions of free radicals, particularly multiple cyclisations and cyclisation/translocation/fragmentation combinations. To examine cascades involving radical addition to unsaturated molecules and subsequent (or prior) cyclisation steps.