

Guest Editorial

Hypervalent Iodine

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Iodine was discovered in 1811 by French chemist Bernard Courtois and it was named by J. L. Gay Lussac in 1813. Its name derives from the Greek word *iodes*, meaning "violet-colored," reflecting both the characteristic lustrous, deep purple color of resublimed crystalline iodine as well as the colour of its vapour. It can be found in seaweed and brine wells. From the early beginning it found extremely useful applications in everyday life. It is known that potassium iodide was used as a remedy for goiter (Derbyshire neck), an enlargement of the thyroid gland, as early as 1819. The thyroid is responsible for the production of thyroxine, a metabolism-regulating hormone. Iodine is an essential trace element for humans and plays an important role in many biological organisms. Among the most common everyday uses of iodine is in halogen lamps, in ink pigments and as a topical antiseptic to kill bacteria.

Because iodine is the largest, least electronegative and most polarisable of the common halogens, it is capable of forming stable polycordinate high-valent (with a value of up to 7, IF_7) compounds. The most common polyvalent organic iodine compounds are I(III) and I(V) species. Since the first stable polyvalent organic iodine compound, the trivalent $PhICl_2$, was prepared by the German chemist C. H. C. Willgerodt in 1886, this field has experienced a great development.

Hypervalent iodine compounds have been extensively used for a variety of chemical transformations and particularly as oxidative reagents. (Diacetoxyiodo)benzene, [bis-(trifluoroacetoxy)iodo]benzene, [hydroxy(tosyloxy)iodo]benzene, iodosylbenzene, the Dess-Martin reagent and 1-hydroxy-1,2-benziodoxol-3(*IH*)-one 1-oxide are some of the most useful and popular contemporary polyvalent organoiodine compounds. Polymer-supported (diacetoxyiodo)benzene has also found interesting synthetic applications recently. Because of their ready availability, their convenience of use and their unique and sometimes selective oxidizing properties (e.g. Dess-Martin periodinane) they are widely employed in the synthesis of complex natural products of biological and medicinal interest.

Another area of significant importance are the various reagents which are very useful for the transfer of aryl, alkenyl, alkynyl and aryne groups. The fact that alkynyliodonium salts may serve as electrophilic acetylene equivalents engendered a renaissance in polyvalent organoiodine chemistry. A

variety of other carbon groups can also be transferred through the zwitterions. Furthermore, nitrogen transfer from sulfonyliminoiodanes has been proven very useful in the synthesis of aziridines.

Over the last decade we have developed a method for the replacement of phenolic hydroxyl by an acyl group in one step *via* oxidation of carbonyl hydrazones of *o*-hydroxyaryl ketones with lead(IV)acetate (LTA). When (diacetoxyiodo)benzene was used instead of LTA it was proven to give excellent yields, being in addition less toxic and costly than lead compounds.

Despite the continuous developments in this field, there are still many areas yet to be investigated. Judging from the advantages of hypervalent organic iodine reagents, it seems certain that they will be further used in sophisticated organic syntheses. It is remarkable that there are many very well known researchers, with long and illustrious careers, whose research is almost exclusively dedicated to hypervalent iodine. It is a pleasure and an honour that some of them have kindly contributed to this special issue and we hope that some new researchers will be these papers inspired and further develop this area in years to follow.

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