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Mesoionic Compounds

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**History of Mesionic Compounds**

Mesionic compounds is a quite extensive going back over a hundred years ago. Mesionic compounds began to be developed beginning in the late 1800s century. Although the term mesionic was not yet to be used, a mesionic compound, benzohydrazone, had been described in 1875. Other mesionic compounds were created between 1879 and when the term mesionic was first used. The compounds produced during this time puzzled the chemist who produced them. Some of the compounds produced before were: 1,3,4-thiadiazole-2-thiolate prepared by Anschütz in 1861 and 1,2,3,4-tetrazole-5-thiolate, or dehydrodithizone, prepared by the chemists Fischer and Besthorn in 1882. Around sixty years later the compound which would eventually lead to the modern day group of mesionic compounds was created. A fused ring structure was suggested for a compound prepared in 1935 by two chemists Earl and Machney which they called a “Sydnone.” The newly created Sydnone was considered to be a type of Lactone, however, in 1949 two other chemists, Baker and Ollis disagreed because the properties of the Sydnone did not match that of a lactone. A definition for the type of compounds like Sydnone was first presented by Baker and Ollis the same year.

The term mesionic though was not introduced right away and is debated as to who was the first to coin the term. It, Mesionic, has been attributed to multiple chemist’s Baker, Ollis, Poole, and Simpson.

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**Uses of Mesionic Compounds**

Mesionic compounds can be for a variety of purposes even being used in areas outside the medical environment. Still, the overwhelming area that mesionic compounds have been beneficial to has been the medical field. In the medicinal field, mesionic compounds are used as drugs as antibacterial, antimalarial, anti-inflammatory, antitumor, fungicide, and analgesic, and many more. Most of the biological activity of mesionic compounds are found in type A compounds while none have been found in type B compounds. In many cases mesionic compounds not only contain one medicinal, biological property, but also include another as well. Another important aspect to the medical field is using mesionic compounds as dyes. The sydnone ring specifically is very good at absorbing visible spectra of ultraviolet and infrared light. Mesionic compounds are really useful not only for medicinal value, but because they are naturally occurring being found in many other products. Some other products include vitamins such as vitamin B1 which contain a mesionic group. A couple other products which contain mesionic compounds are insecticides, herbicides, and even some teas. Mesionic compounds have also been used to make elastic polymers, in the paper industry, and the industry.

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**What is a Mesionic Compound?**

A mesionic compound is a type of organic heterocyclic compound. Heterocyclic compounds are ring molecules containing other elements in ring structure besides just carbon. Some of the elements found in heterocyclic compounds include sulfur, oxygen, nitrogen, and sometimes other heavier elements such as selenium and tellurium. Besides being a heterocyclic compound, mesionic compounds are also a subclass of the type of compounds called betaines. Currently there are two popular proposed definitions of mesionic compounds. In one definition, mesionic compounds are classified as five-membered heterocycles that cannot be structurally represented any other covalent or polar structure and have a sextet of electrons comprising the ring. The other definition is less restrictive and includes heterocyclic compounds comprising of six atoms. Six member rings are sometimes excluded because they can easily be associated with mesionic betaines which are slightly different than true mesionic compounds. Mesionic compounds are also commonly held to be aromatic upholding Hückel’s Rule. The sextet of p electrons found in mesionic compounds, the ability to undergo electrophilic substitution, and the delocalization of the positive charge in the sydnone ring are used as evidence for aromaticity.

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**Sydnones**

Sydnones are considered the building block for all other mesionic compounds. Besides being the building block for all other mesionic compounds, the physical characteristics of sydnones make them advantageous to the medical world. Sydnones are small, planar, and overall neutral. Such characteristics are a couple of the reasons why sydnones show promise in a variety of types of drugs. A specific reason is the overall neutrality of the molecule to pass through certain membranes other drugs cannot pass through. There are serious methods to produce sydnones, but the most common method requires two steps: Ni-reduction followed by cyclodehydration. The process uses the cyclodehydration of Ni-substituted nitro-amino acids with an arylidine like acetic arylhydride. The product of the mesionic compound is typically a crystalline solid at room temperature, but some allylated sydnones sometimes can be a liquid.

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**Thiazoles**

Thiazoles are mesionic compounds that contain a sulfur atom in the sydnone ring. Many of the thiazoles are naturally occurring and constitute one of the most studied groups of mesionic compounds after sydnones. In the medical field, thiazoles are the bases for sulfa drugs which have been widely used worldwide. Along with being used in sulfa drugs, thiazolium salts have been used as dyes, fungicides, discovered to have antioxidant characteristics, and used in the production of rubber products. A majority of the Thiazoles have been used to develop drugs and will continue to be one of the key building blocks for future drugs.

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**Thiazoles**

Thiazoles, until the 1960s, had not been studied much and the biological benefits were unknown. After the 1960s, the importance of quinazoline was discovered with the extraction of one of its derivatives from the Chinese plant “chan-shan.” The derivative proved to be a good antimalarial agent, but was too toxic for human consumption. Further investigation brought about the discovery of the desired antimalarial arylthiazole. The structure of quinazolines consists of two fused six member simple aromatic rings. Relative ease of synthesis, availability of its derivatives, and multiple biological characteristics will continue to attract future chemists.

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**Quinazolines**

Quinazolines are mesionic compounds consisting of a benzene derivative, the compound is called a Benzathiione. Such compounds are specialized products and most commonly are synthetic compounds. The combination of a thiazole with a benzene derivative results in a quite stable compound. Many such fused mesionic compounds have been used in a variety of areas including herbicides, the paper industry as slimicides, and in special types of photography. The ability to be not only as a medicinal agent but also in many other industrial areas will work to keep chemist looking to discover new ways to use Benzothiazines.

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**Piperazines**

Piperazines are mesionic compounds consisting of six member rings with two opposite nitrogen atoms. The development of piperezine was originally intended only for the treatment of gout. It was not effective as a drug against gout because of many adverse side-effects. Later derivatives of piperezine resulted in many of the already mentioned medicinal characteristics such as anticonvulsant and antidepressants. Like benzothiazines, piperazines are widely used in other industries to make plastics, resin, brake fluid, and other materials. Another negative to this mesionic compound is that its popularity is due also to the ability to abuse its effects which are not quite as potent as other illicit drugs.

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**Works Cited**