Delving into the Realm of Selectivity: A Comprehensive Exploration of Cyclic Sulfonamides Synthesis

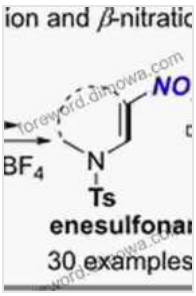
Cyclic sulfonamides, a class of sulfur-containing heterocycles, have garnered significant attention in both academia and the pharmaceutical industry due to their intriguing biological activities and therapeutic potential. As such, the selective synthesis of these valuable compounds has become a topic of paramount importance in the field of organic chemistry.

Chemical Diversity and Biological Significance

Cyclic sulfonamides exhibit a remarkable array of structural motifs, including azetidines, pyrrolidines, piperidines, and morpholides, which contribute to their diverse biological properties. They have demonstrated promising activity against an array of targets, including cancer, infectious diseases, inflammation, and neurological disFree Downloads. Some notable examples include celecoxib (a nonsteroidal anti-inflammatory drug),sulfanilamide (an antibacterial agent),and topiramate (an anticonvulsant).

Challenges and Strategies in Selective Synthesis

The selective synthesis of cyclic sulfonamides poses unique challenges due to the potential formation of regio- and stereoisomers. To overcome these hurdles, researchers have developed a range of strategies that exploit regio- and stereoselective reactions, including:



Selectivity in the Synthesis of Cyclic Sulfonamides: Application in the Synthesis of Natural Products (Springer Theses) by Ed Hiserodt

4.6 out of 5

Language	: English
File size	: 6837 KB
Text-to-Speech	: Enabled
Screen Reader	: Supported
Enhanced typesetting	: Enabled
Print length	: 164 pages

Regiocontrol

> - **Ring-Closing Metathesis:** Olefin metathesis reactions involving sulfonylaziridines or sulfonylalkenes allow for efficient ring-closure, providing regiospecific access to cyclic sulfonamides. > - **Intramolecular Nucleophilic Attack:** Sulfonyl chlorides can undergo intramolecular nucleophilic attack by a nearby amine, leading to the formation of cyclic sulfonamides with controlled regiochemistry. > - **Directed Ortholithiation:** Directed ortho metalation of sulfonylaryl compounds can be exploited to generate regiospecific sulfonamide precursors for cyclization.

Stereoselectivity

> - **Asymmetric Catalysis:** Transition-metal-catalyzed asymmetric reactions, such as allylic amination or cycloaddition, can provide highly enantioselective routes to chiral cyclic sulfonamides. > - **Chiral Auxiliaries:** Chiral auxiliaries can be temporarily attached to the substrate to control the stereochemical outcome of the cyclization reaction. > - **Substrate Control:**

The inherent stereochemistry of the starting materials can influence the stereoselectivity of the cyclization process.

Selected Case Studies

Diastereoselective Synthesis of β-Lactams

In the context of β-lactam antibiotics, the diastereoselective synthesis of cyclic sulfonamides is crucial. Researchers have employed strategies such as directed epoxidation, followed by ring-opening with a sulfonamide nucleophile, to achieve high levels of diastereoselectivity.

Enantioselective Synthesis of Spirocyclic Sulfonamides

Spirocyclic sulfonamides exhibit unique structural features and biological activities. Their enantioselective synthesis has been achieved using asymmetric catalysis, employing chiral ligands or organocatalysts to control the stereochemistry of the cyclization step.

The selective synthesis of cyclic sulfonamides continues to be a vibrant area of research, driven by the discovery of novel biological activities and the need for efficient and stereoselective synthetic methods. The strategies outlined in this article provide a comprehensive overview of the current state-of-the-art approaches in this field. As research progresses, we can anticipate the development of more sophisticated and versatile methods for accessing these valuable heterocycles, paving the way for the discovery of new and improved therapeutic agents.

Image Optimization

Alt Attribute for Image 1:

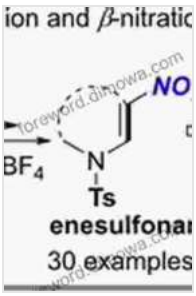
"Schematic representation of the regio- and stereoselective synthesis of cyclic sulfonamides."

Alt Attribute for Image 2:

"Diastereoselective synthesis of β-lactams using directed epoxidation and ring-opening with a sulfonamide nucleophile."

Alt Attribute for Image 3:

"Enantioselective synthesis of spirocyclic sulfonamides through asymmetric catalysis with chiral ligands."



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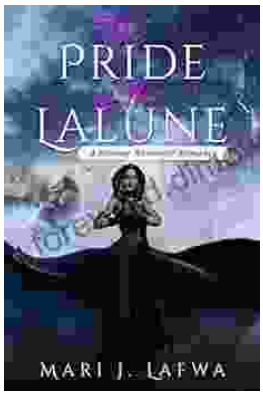

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