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Dimethyl sulfoxide Manufacturing

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Abstract:

This study introduces an innovative methodology for synthesizing dimethyl sulfoxide (DMSO), a valuable solvent and pharmaceutical compound, from methanol. Given the abundant reserves of natural gas and the growing demand for DMSO in various industries, this research explores a sustainable and cost-effective production route. The proposed method involves a three-step process. Initially, methanol is made from natural gas. After that, the methanol is combined with H_2S to produce DMS. Then DMS is oxidized with H_2O_2 to produce DMSO and water. Through this process, not only is the DMSO product obtained, but also, the environment is protected from the toxic H_2S , where H_2S is converted completely with methanol to DMSO. This approach has the potential to revolutionize the production of DMSO by leveraging the vast, underutilized natural gas resources, thereby contributing to the sustainable chemical manufacturing paradigm.

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Chapter One

Introduction

Introduction:

Dimethyl sulfoxide, commonly called DMSO, is a natural chemical compound with the formula $(\text{CH}_3)_2\text{SO}$. This colorless liquid is an important solvent that dissolves both polar and nonpolar compounds and is miscible in a wide range of organic solvents as well as water. DMSO has the unusual property that many individuals perceive a garlic-like taste in the mouth after contact with the skin. Derived from trees as a by-product from the manufacturing of paper. It is composed of two methyl groups (CH_3) and a sulfur and an oxygen atom (Scott 2013).

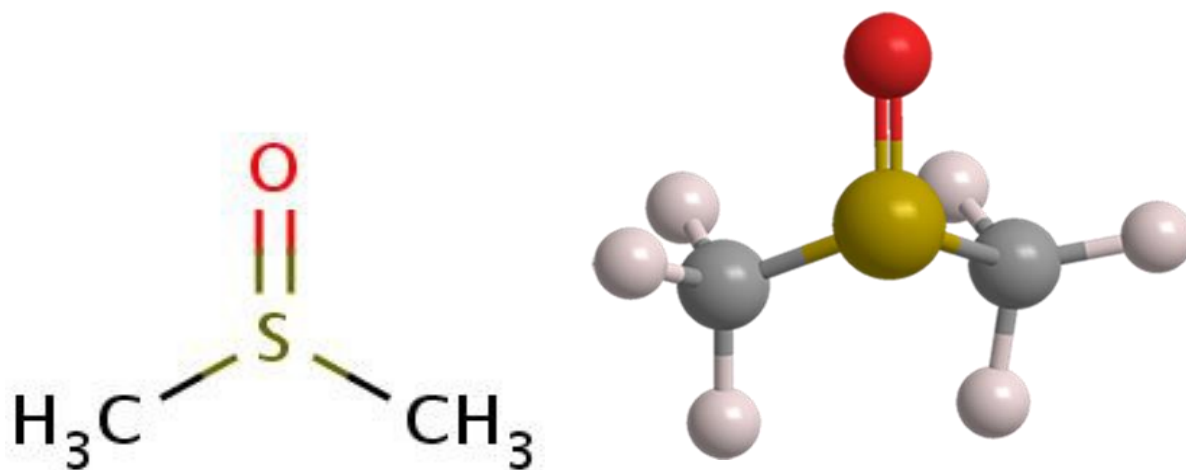


FIGURE 1-DIMETHYL SULFOXIDE

It has been used in the treatment of hundreds of ailments that afflict people throughout the world. In fact, by itself, or in combination with other Medications.

REFERENCES

Aasberg-Petersen, K., et al. (2008). "Large scale methanol production from natural gas." Haldor Topsoe **22**.

BYJUS (2024). "dimethyle sulfoxide (C₂H₆OS)-structure ,molecular mass,properties and uses."

life, A. c. f. (september 20,2021). "Dimethyle sulfoxide."

Lockie, L. M. and B. M. Norcross (1967). "A clinical study on the effects of dimethyl sulfoxide in 103 patients with acute and chronic musculoskeletal injuries and inflammations." Annals of the New York Academy of Sciences **141**(1): 599-602.

Martin, D., et al. (1967). "The solvent dimethyl sulfoxide." Angewandte Chemie International Edition in English **6**(4): 318-334.

Scott, A. H. (2013). The DMSO Handbook for Doctors, iUniverse.