

# Microbial Conversion of Volatile (Organic) Sulfur Compounds in Oxic and Anoxic Environments

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## Introduction:

Several environmental problems (e.g. acid rain and odor problems) are related to Volatile (Organic) Sulfur Compounds (V(O)SC) like  $\text{SO}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{CS}_2$  and several methylated sulfur compounds. Release of these compounds to the atmosphere should therefore be avoided. Anthropogenic activities that release large amounts of V(O)SC are composting facilities and waste (water) treatment plants and the paper, viscose and textile industry.

## Aims of study:

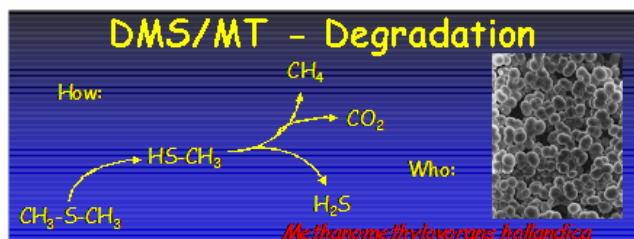
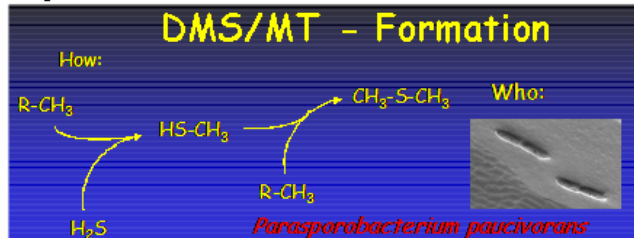
- Identify and study the major bacterial mechanisms for V(O)SC formation and degradation in oxic and anoxic environments.
- Application of the knowledge gained in the environmental biotechnology to treat V(O)SC-containing gas streams.

## Key role players:

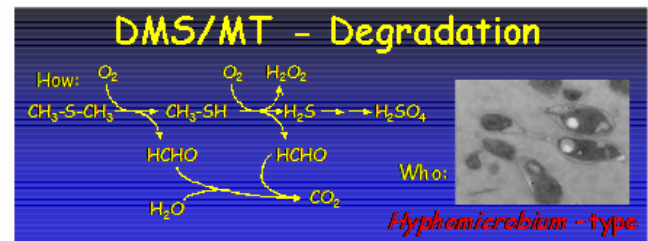
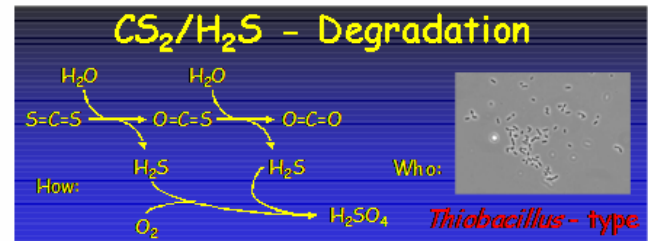
Compound	Formula	Source
Sulfur dioxide	$\text{O}=\text{S}=\text{O}$	E
Hydrogen sulfide	$\text{H}-\text{S}-\text{H}$	W, P, T, C, F
Carbon disulfide	$\text{S}=\text{C}=\text{S}$	T, C
Methylmercaptane	$\text{CH}_3-\text{SH}$	W, P, F
Dimethyl sulfide	$\text{CH}_3-\text{S}-\text{CH}_3$	W, P, F

Note: Different sources for V(O)SC: Energy power plants (E), Waste(water) treatment plants (W), Paper industry (P), Textile and Viscose Industry (T), Chemical industry (C), Composting facilities (F)

## Major mechanisms in anoxic environments:



## Major mechanisms in oxic environments (at low pH):

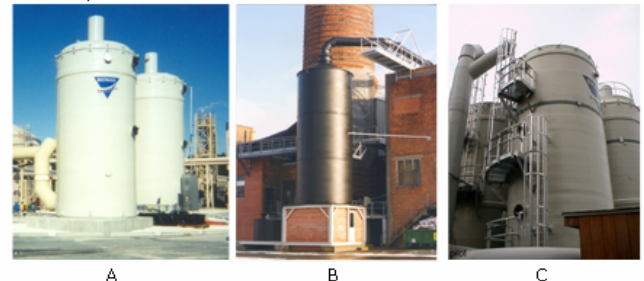


## Application of V(O)SC degrading bacteria in environmental biotechnology:

Bacteria that are able to degrade V(O)SC are successfully applied by Bioway for:

- Desulfurization of biogas
- Tackling of odor problems
- Desulfurization of industrial gas streams

This already resulted in large number of full-scale treatment plants in Europe, Asia and the United States of America. These installations treat gas streams from anaerobic digestors, waste (water) treatment plants, waste water pump stations and the viscose and chemical (e.g. pesticide) industry.



Full-scale installation realized by Bioway b.v. treating  $\text{H}_2\text{S}/\text{VOC}$ -containing gas streams (A) and  $\text{H}_2\text{S}/\text{CS}_2$ -containing gas streams (B and C)

## Conclusions:

Several bacterial mechanisms for the the degradation of V(O)SC have been elucidated and application of the selected V(O)SC degrading bacteria by Bioway b.v. appeared to be feasible for the treatment of a large variety of gas streams.