

Residence Time for Hydrogen Sulfide in the Atmosphere Literature Search Results

By James Bowyer, February 6, 2003

Synopsis:

Given the information below, it would appear that the residence time for hydrogen sulfide (H₂S) in air is generally in the range of 18 hrs to 3 days depending on atmospheric conditions and the levels of ozone and OH radicals (from smog reactions, i.e. photochemical reactions). A maximum time of 42 days was noted in one reference but this was in a high latitude location in winter, i.e. very cold, which slows reaction rates. A minimum time of 2 hours was noted in another reference in the presence of "polluted urban air" (an undefined term).

Additionally, H₂S appears not to react photochemically, i.e. light doesn't appear to cause a direct reaction in which H₂S is changed to another chemical compound.

Literature Search Results:

The following are the results of a limited literature search for the residence time of hydrogen sulfide in the atmosphere.

ATSDR H₂S Toxicological Profile ⁽¹⁾

Residence Time: Less than 1 day to 42 days

Comments:

1. "Hydrogen sulfide in the air is oxidized at a relatively slow rate by molecular oxygen, but at a much faster rate by hydroxide (OH) radicals, forming the sulfhydryl radical and ultimately sulfur dioxide or sulfate compounds ^(2,3)
2. Atmospheric residence time is typically less than 1 day ⁽²⁾ but as high as 42 days in winter at 55° N latitude ⁽⁴⁾
3. Hydrogen sulfide does not react photochemically.

ATSDR ToxFAQs™ for Hydrogen Sulfide ⁽⁵⁾

Residence Time: Approx. 18 hours

Comments:

"When released as a gas, it will form sulfur dioxide and sulfuric acid in the atmosphere."

California Air Resources Board (CARB) Toxic Air Contaminants Fact Sheet on H₂S ⁽⁶⁾

Residence Time: 3 days

Comments:

"The calculated half-life and lifetime of hydrogen sulfide due to reaction with the OH radical are 2.1 days and 3.0 days, respectively." ⁽⁷⁾

U.S. EPA. 1993 Report to Congress on hydrogen sulfide air emissions associated with the extraction of oil and natural gas. ⁽⁸⁾

Residence Time: 3 days

World Health Organization, Environmental Health Criteria 19, Hydrogen Sulfide ⁽⁹⁾

Residence Times: 1.7 days in the presence of ozone levels of 0.05 mg/m³ ⁽¹⁰⁾
2 days in relatively clean air and 2 hours in polluted urban air ⁽¹¹⁾

Iowa State University and The University of Iowa Study Group Report (Feb 2002) ⁽¹²⁾

Residence Time: Lower atmosphere lifetime of 3.0 days ⁽¹³⁾

References

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