

# Hypobromous Acid. Safety & Chemistry Information

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# Outline

- Definitions of safety terms on an MSDS
- HB2
- Bromine
- Volatility
- Conclusions
- Incident when workers were exposed to fumes
- Contact

# TWA

- **Time Weighted Average**
  - Average value of exposure permissible by OSHA over the course of an 8 hour shift.
    - \_ Sometimes called Threshold Limiting Value (TLV)
      - Usually lower than STEL

# STEL

- **Short Term Exposure Limit** – Defined by American Conference of Government Industrial Hygienists (ACGIH) as the concentration of a chemical that a worker can be continuously exposed to for a short period of time without suffering from:
  - Irritation
  - Chronic or irreversible tissue damage
  - Narcosis of a sufficient degree to increase the likelihood of accidental injury, impair self-rescue, or materially reduce work efficiency.

# STEL

- Workers can be exposed to a maximum of 4 STEL periods per 8 hour shift if there are at least 60 minutes between exposure periods
- STEL is often referred to as the Permissible Exposure Limit (PEL)

# What is HB2?

- 24% Hydrogen Bromide in water
- Activated with NaOCl bleach to form hypobromous acid (HOBr) **NOT elemental bromine.**
  - HOBr is a effective sanitizer that is unstable and must be generated (activated) at the point of use.
- Since you cannot simply purchase a drum of HOBr, exposure limits are not available nor are they mandated by OSHA.
  - Airborne HOBr reacts with air sampling tubes in the same way as elemental bromine or chlorine.

# Elemental Bromine MSDS

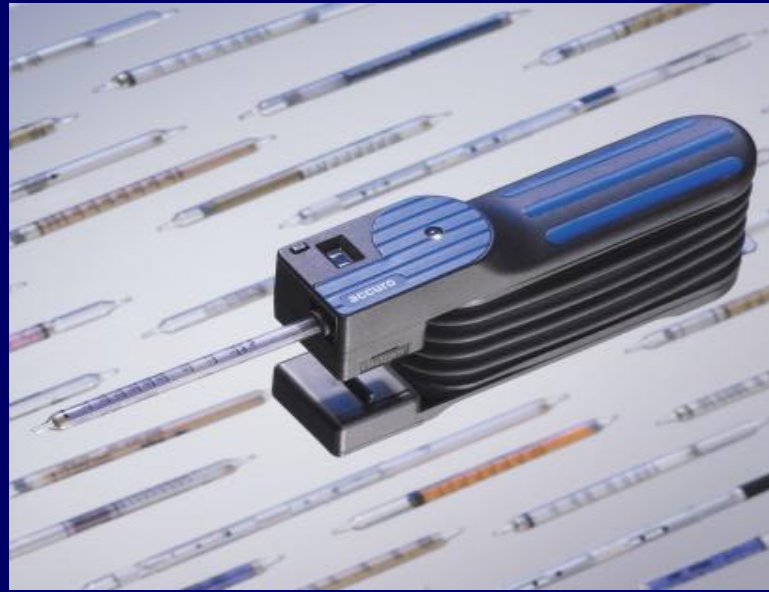
**Appearance:** Dark, reddish-brown fuming liquid.

**Odor:** Pungent Odor

**TWA:** 0.1 ppm

**STEL:** 0.2 ppm

# Draeger Tubes



- Designed for on-the-spot measurements at a particular spot over a relatively short time, providing a quantitative results with a high degree of accuracy and selectivity.
- Ideal for evaluating concentration fluctuations in the workplace and measuring contaminants in workers' breathing zones



# Volatility

- Volatility- A measure of the tendency of a substance to vaporize.
- Compounds that are more volatile have a stronger tendency to become airborne and affect the eyes and respiratory system.

# Relative Volatility – Henry's Law

A measure of the tendency of a substance to vaporize.

Antimicrobial	Formula	H (atm) @20°C
<b>Ozone</b>	<b>O<sub>3</sub></b>	<b>5000</b>
<b>Chlorine</b>	<b>Cl<sub>2</sub></b>	<b>585</b>
<b>Bromine</b>	<b>Br<sub>2</sub></b>	<b>59.3</b>
<b>Chlorine Dioxide</b>	<b>ClO<sub>2</sub></b>	<b>54.0</b>
<b>Monochloramine</b>	<b>NH<sub>2</sub>Cl</b>	<b>0.45</b>
<b>Hypochlorous Acid</b>	<b>HOCl</b>	<b>0.076</b>
<b>Hypobromous Acid</b>	<b>HOBr</b>	<b>0.030</b>

*(Hypohalous Acid and Haloamine Flashoff in Industrial Evaporative Cooling Systems; McCoy, Blatchley, & Johnson)*

# Relative Volatility – Henry's Law

<b>Antimicrobial</b>	<b>X's more volatile than hypobromous acid</b>
<b>Ozone</b>	<b>166,666</b>
<b>Chlorine</b>	<b>19,500</b>
<b>Bromine</b>	<b>1976</b>
<b>Chlorine Dioxide</b>	<b>1800</b>
<b>Monochloramine</b>	<b>15</b>
<b>Hypochlorous Acid</b>	<b>2.5</b>

# Conclusions

- HOBr is 2.5 times less volatile than free chlorine (hypochlorous acid).
- HOBr is unstable over time and has to be generated at the point of use.
- HOBr is one of the least volatile antimicrobials widely used by the meat and poultry industry.

# Incident When Workers Were Exposed to Fumes. Possible Scenario

- Hypobromous acid is only hypobromous acid at  $\text{pH} > 5.5$  (it changes species)
- At lower pH, it starts reverting to elemental bromine, which is 1,976 times more volatile
- Contact with PAA solutions, a pH 4.5 could cause bromine or chlorine gas
- Avoid contacting hypobromous acid with other stronger acids or low pH conditions

# Contact Info

Do not hesitate to contact Enviro Tech directly with any additional questions or concerns.

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