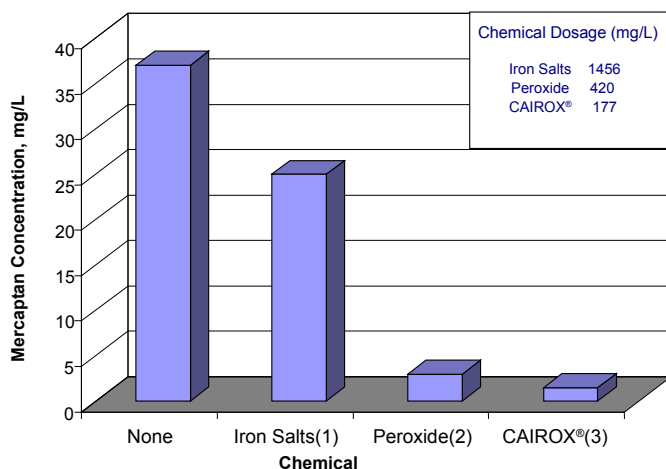




BACKGROUND

In municipal and industrial waste treatment, hydrogen sulfide is not the only offensive gas generated from anaerobic decomposition. Mercaptans (RSH) are the organic equivalent to hydrogen sulfide and more odorous at 1/1000th the concentration. Mercaptans are naturally occurring from the degradation of sulfur containing organics (proteins, etc.). A table of commonly found mercaptans is presented on the reverse side.

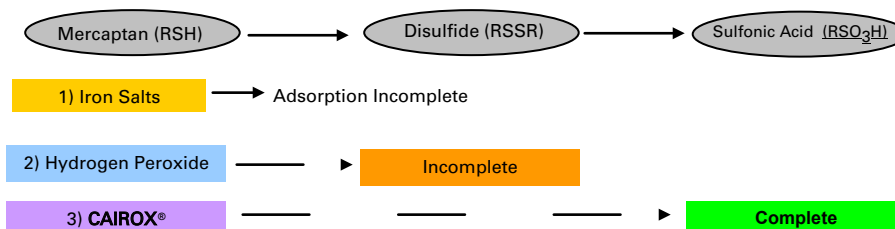
Oxidation is the only method that completely eliminates mercaptan odors. Precipitation technology may adsorb some mercaptans, but may readily release the adsorbed molecules. Removal of sulfide by precipitation often allows the odor from mercaptans to be more apparent and equally offensive. A comparison of mercaptan removal technologies is given below. The first step in oxidation is the formation of disulfide (RSSR) and this is ultimately oxidized to the non-odorous Sulfonic Acid (RSO₃H).



- (1) Iron Salts react by adsorbing on a precipitate, (reversible release).
- (2) Peroxide reacts by oxidizing to disulfide, (incomplete removal).
- (3) CAIROX® reacts by oxidizing to disulfide and by further oxidation to sulfonic acid, (complete removal).



Oxidation of mercaptans proceeds in a stepwise fashion. Disulfide first is formed before leading to sulfonic acid as the final product.



Removal Efficiency

CAIROX potassium permanganate and hydrogen peroxide can both form the disulfide, however, peroxide requires a catalyst and is slow reacting. The disulfide is a water soluble molecule which can readily revert to mercaptan. Disulfides often retain the odor of the mercaptan and are bio-inhibitory.

The uniqueness of CAIROX usage is that it will immediately and completely oxidize the mercaptans and disulfide as it is formed. CAIROX provides the most effective and immediate elimination of this serious odor problem.

Substance	Characteristic Odor	Odor Threshold ppm	Reactivity		
			CAIROX® KMnO ₄	Hydrogen Peroxide H ₂ O ₂	Iron Salts Fe ⁺² and Fe ⁺³
Allyl Mercaptan	Strong garlic -coffee	0.00005	Immediate	CAT ¹	N/A ²
Amyl Mercaptan	Unpleasant -putrid	0.0003	Immediate	CAT ¹	N/A ²
Benzyl Mercaptan	Unpleasant -strong	0.00019	Immediate	CAT ¹	N/A ²
Crotyl Mercaptan	Skunk-like	0.000029	Immediate	CAT ¹	N/A ²
Dimethyl Sulfide	Decayed Vegetables	0.0001	Immediate	CAT ¹	N/A ²
Ethyl Mercaptan	Decayed cabbage	0.00019	Immediate	CAT ¹	N/A ²
Methyl Mercaptan	Decayed cabbage	0.0011	Immediate	CAT ¹	N/A ²
Propyl Mercaptan	Unpleasant	0.000075	Immediate	CAT ¹	N/A ²
Sulfur Dioxide	Pungent, irritating	0.009	Immediate	CAT ¹	N/A ²
Tert-butyl Mercaptan	Skunk, unpleasant	0.00008	Immediate	CAT ¹	N/A ²
Thiocresol	Skunk, rancid	0.000062	Immediate	CAT ¹	N/A ²
Thiophenol	Putrid, garlic-like	0.000062	Immediate	CAT ¹	N/A ²

1. Requires catalysis for reaction, slow reaction with catalysis.
2. N/A - No affect (Adsorption is reversible).

Adapted from : Odor Control for Wastewater Facilities. Manual of Practice No. 22, Water Pollution Control Federation, Washington, DC, 1979.