properties of unlinked carbamate esters. For the purpose of this rulemaking, all salts or esters of carbamic acids with molecular weight less than 1000 daltons and/or Log octanol/water partition coefficient values of less than 8 are included. Carbamoyl Oximes

A carbamoyl oxime has the following chemical structure:

$$\begin{array}{c|c} R_2 & O & R_4 \\ | & \parallel & | \\ R_1 - N - C - O - N = C - R_3 \end{array}$$

Carbamoyl oximes are a combination of the carbamate functionality and the



oxime functionality. Oximes are characterized by the structure RO-N=C- R_1 , R_2 where R_1 and R_2 can be a hydrogen or any organic group beginning with a carbon atom. The oxygen atom of the carbamate structure is used as a bonding point between the carbamate and oxime groups as shown in the following diagram:

BILLING CODE 6560-50-P

BILLING CODE 6560-50-C

For the purpose of this rulemaking, all salts or esters of carbamoyl oximes with molecular weight less than 1000 daltons and/or Log octanol/water partition

For the purpose of this rulemaking, all salts or esters of thiocarbamic acids with molecular weight less than 1000 daltons and/or Log octanol/water partition coefficient values of less than 8 are included.

Dithiocarbamates

The dithiocarbamate differ from carbamates in that each oxygen atom of

coefficient values of less than 8 are included.

Thiocarbamates

Thiocarbamates may be produced from the reaction of a carbamoyl

$$\begin{array}{cccc} R_2 & O & R_2 & O \\ | & \parallel & & \parallel \\ R_1 - N - C - S - R_3 & \text{or} & R_1 - N - C - O - R_3 \end{array}$$

the C(=O))O moiety is replaced with sulfur atoms. Dithiocarbamate esters have the following generic structure:

$$\begin{array}{c}
\mathbf{R}_{2} \ \mathbf{S} \\
\parallel \\
\mathbf{R}_{1} - \mathbf{N} - \mathbf{C} - \mathbf{S} - \mathbf{R}_{3}
\end{array}$$

chloride with a mercaptan and differ from carbamates by the substitution of either oxygen atom with a sulfur atom as shown in the following diagram:

Dithiocarbamic acid is commercially important but is very unstable. As a result, it is often isolated as a metal salt. Usually, one or more hydrogen atoms on the amine function are replaced by an organic group. The following figure shows a typical reaction to produce a dithiocarbamic acid salt:

 $\begin{array}{ccc} R & S \\ & M + \begin{bmatrix} S \\ M \\ R_2 N - C - S \end{bmatrix} - \\ Carbon disulfide & amine & dithiocarbamic acid metal salt \end{array}$

For the purpose of this rulemaking, all salts or esters of dithiocarbamic acids with molecular weight less than 1000 daltons and/or Log octanol/water partition coefficient values of less than 8 are included.

Thiocarbamoylsulfenamides which are derivatives of dithiocarbamic acids are not subject to this rulemaking. Both alkyl and ethylene dithiocarbamates can form salts with metal ions and both can be oxidized to the corresponding thiuram sulfides (bis(aminothiocarbonyl)sulfides). Mono, di, tri and tetra sulfides are known and are included in this rulemaking. Thiuram sulfides have the following generic structure:

$$\begin{array}{c|ccc} R & S & S & R \\ & & \parallel & \parallel & \parallel \\ R - N - C - (S)_n - C - N - R \\ \text{wheren} = 1, 2, 3, 4 \end{array}$$

These sulfides are the linkage of two dithiocarbamic acids and are classed as dialkyldithiocarbamates in this rule, because thiuram sulfides are known to