1. The type first reported by Fuller and Crist (1941),

$$\frac{d[SO_4^{2-}]}{dt} = (k_{86a} + k_{86b}[H^+])^{0\ 5}\,[SO_3^{2-}] \qquad (86)$$

2. The type first reported by Winkelmann (1955),

$$\frac{d[SO_4^{2-}]}{dt} = k_{87}\,[SO_3^{2-}] \qquad (87)$$

3. The type observed by Beilke et al. (1975)

$$\frac{d[SO_4^{2-}]}{dt} = k_{88}\,[H^+]^{-0.16}\,[SO_3^{2-}]. \qquad (88)$$

It is presently unresolved as to which type of rate expression is correct. Doubt is cast on "type 3" found by Beilke et al. (1975) because of the use of a plastic vessel that could have introduced trace organic inhibitors into the system. All of the other studies (yielding "types 1 and 2") were performed with two-phase systems whose mass transfer properties were insufficiently reported.

The auto-oxidation is inhibited by trace concentrations of organic species. The classes of organic species capable of serving as inhibitors include alcohols, glycols, aldehydes, ketones, phenols, amines, and acids. Bäckström (1934) first demonstrated that the inhibition of sulfite oxidation can be expressed as:

$$\frac{d\,[SO_4^{2-}]}{dt} = [A/(B + m)]\,k_{89}\,[SO_3^{2-}] \qquad (89)$$

where

k_{89} = the uninhibited rate constant,
A,B = constants that are functions of the inhibitor, and
m = molar concentration of the inhibitor.