COMPONENTS:	EVALUATOR:
1. Potassium sulfite; K_2SO_3; [10117-38-1] 2. Water; H_2O; [7732-18-5]	Mary R. Masson, Dept. of Chemistry, University of Aberdeen, Meston Walk, Old Aberdeen, AB9 2UE, Scotland, UK. March 1984

CRITICAL EVALUATION:

Only Foerster *et al.* (1) have studied the binary system potassium sulfite - water, but data are also available from studies of ternary systems (2 - 6). The solid phase reported in all the solubility studies was the anhydrous salt. (In some early work reported by Mellor, a monohydrate and a dihydrate were believed to have been synthesized, but no solubility data for these salts is available.)

The data of Hölzl (6) differ markedly from the rest; there is no obvious reason for the difference, since the work appears to have been done under oxygen-free conditions, and the solid phase is stated to be K_2SO_3. It does appear possible that the solid phase was incorrectly identified, and that some hydrate was present in this sytem. These data were all rejected.

The data of Babenko (3 - 5) also differ somewhat from the other data (1,2). This may have arisen because the work of Babenko appears to have been done with the solutions in contact with air, since it was concerned with the properties of fertilizer formulations: thus contamination with carbon dioxide or oxidation of sulfite to sulfate may have affected the results. The regression line found for Babenko's results was

$$y = 52.0 + 0.021(T - 273.2) \qquad s = 0.03$$

All of Babenko's results were, therefore, also omitted from the data set used for calculation of the general regression line, which is

$$y = 51.3 + 0.00756(T - 273.2) + 0.00010(T - 273.2)^2 \qquad s = 0.16$$

where $y = 100w$ is the solubility in mass %, T is the temperature in K, and s is the estimated standard deviation of the dependent variable about the regression line.

TENTATIVE SOLUBILITIES

The following tentative solubility values were calculated from the regression equation.

T/K	Solubility	
	mass %	molality mol/kg
243.2	51.16	6.62
253.2	51.19	6.63
263.2	51.23	6.64
273.2	51.30	6.66
283.2	51.39	6.68
293.2	51.49	6.71
298.2	51.55	6.72
303.2	51.62	6.74
313.2	51.76	6.78
323.2	51.93	6.83
333.2	52.11	6.88
343.2	52.32	6.933
353.2	52.54	6.99
363.2	52.79	7.06
373.2	53.06	7.14

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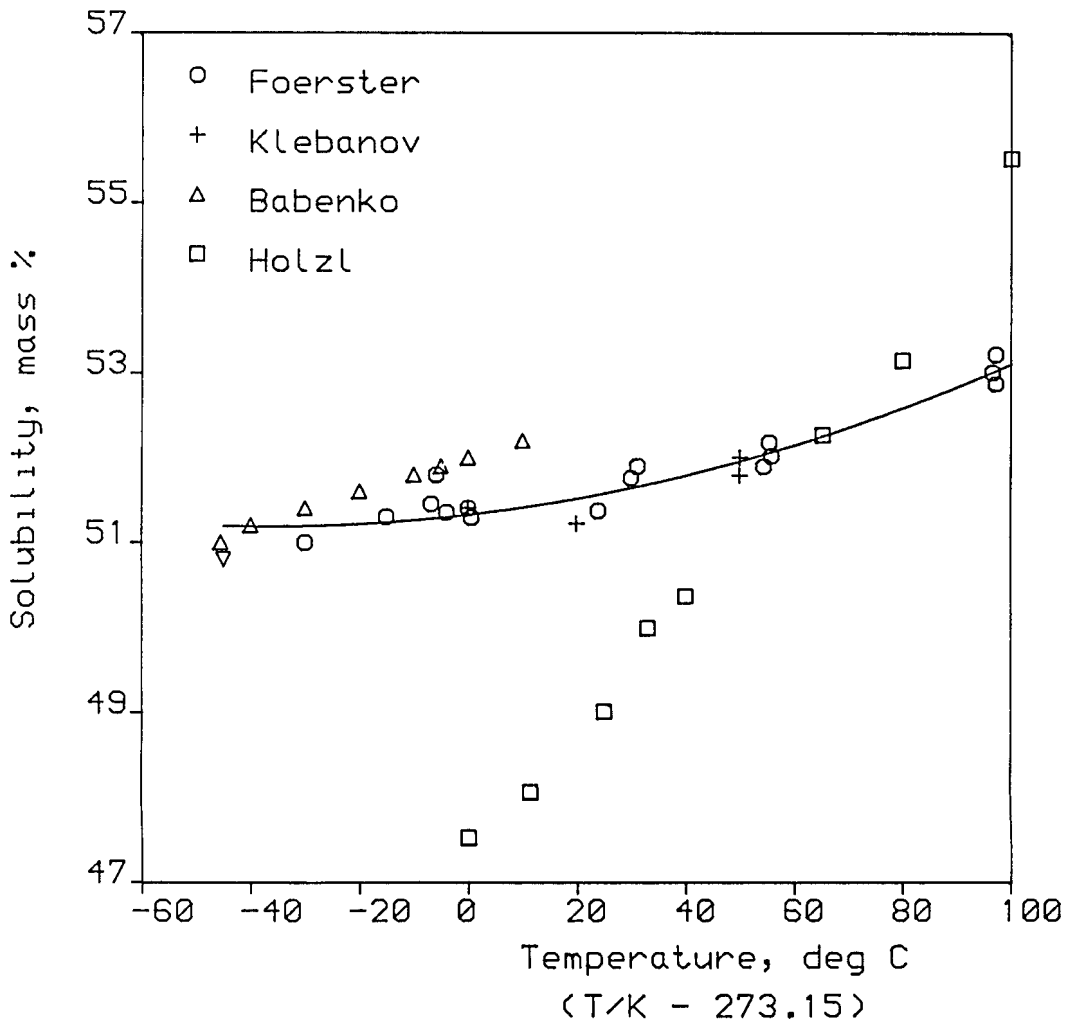
CRITICAL EVALUATION: (continued)



Data for the solubility of potassium sulfite in aqueous t-butanol, said to come from a paper by Ginnings and Robbins (8), have been reported (9). However, inspection reveals that the original paper gives no data for K_2SO_3, but "K_2SO_3" does appear in a table as a misprint for "K_2CO_3".

Foerster *et al.* (1) also give data for the equilibrium with ice. The regression equation for this data is:

COMPONENTS:	EVALUATOR:
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CRITICAL EVALUATION: (continued)

$$(T - 273.15) = 0.0623 - 0.338y + 0.0646y^2 - 0.000339y^3 \qquad s = 0.096 \text{ (12 pts)}$$

or

$$y = 0.763 - 3.34(T - 273.2) - 0.0939(T - 273.2)^2 - 0.000988(T - 273.2)^3$$
$$s = 0.74 \text{ (12 pts)}$$

where the symbols have the same meanings as above.

TERNARY AND QUATERNARY SYSTEMS

The systems K_2SO_3-C_2H_5OH-H_2O (2), K_2SO_3-KNO_3-H_2O (3), K_2SO_3-KNO_2-H_2O (4), K_2SO_3-urea-H_2O (5), K_2SO_3-KOH-H_2O (6), K_2SO_3-H_2SO_3-H_2O (7), K_2SO_3-K_2SO_4-H_2O (10) and K_2SO_3-K_2CO_3-H_2O (11), have been studied, but no comparisons were possible. The quaternary system K_2SO_3-K_2CO_3-K_2SO_4-H_2O (11) has also been examined.

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