

COMPONENTS: 1. Hydrogen sulfide; H ₂ S; [7783-06-4] 2. Seawater	EVALUATOR: Peter G.T. Fogg, Department of Applied Chemistry and Life Sciences, Polytechnic of North London, Holloway, London N7 8DB, U.K. February 1987
CRITICAL EVALUATION: This system has been investigated at barometric pressure by Douabul and Riley (1) but no other set of measurements are available for direct comparison. The seawater was made slightly acidic by adding sulfuric acid to give a concentration of 0.004 mol dm ⁻³ . Ancillary measurements of the solubility of hydrogen sulfide in pure water and in sulfuric acid of this concentration demonstrated that the effect of addition of acid was almost imperceptible. The solubilities in pure water are in close agreement with measurements by other modern workers. The authors have shown that their measurements are consistent with an equation for the solubility of gases in seawater developed by Weiss (2). They have also shown that extrapolation of solubilities of hydrogen sulfide in perchlorate solutions, as measured by Gamsjäger <i>et al.</i> (3), to an ionic strength of 0.7 gives a value which differs by about 3% from the solubility in sea-water of the same ionic strength. They suggested that this difference could be accounted for by differences in degrees in hydration of ions in the two media. <u>References</u> 1. Douabul, A.A.; Riley, J.P. <i>Deep-Sea Res.</i> <u>1979</u> , <i>26A</i> , 259-268. 2. Weiss, R.F. <i>Deep-Sea Res.</i> <u>1970</u> , <i>17</i> , 721-735. 3. Gamsjäger, H.; Rainer, W.; Schindler, P. <i>Monatsh. Chem.</i> <u>1967</u> , <i>98</i> , 1793-1802.	

COMPONENTS: 1. Hydrogen sulfide; H ₂ S; [7783-06-4] 2. Sea-water 3. Sulfuric acid; H ₂ SO ₄ ; [7664-93-9]			ORIGINAL MEASUREMENTS: Douabul, A.A.; Riley, J.P. <i>Deep-Sea Res.</i> <u>1979</u> , 26A, 259 - 268.		
VARIABLES: Temperature			PREPARED BY: P.G.T. Fogg		
EXPERIMENTAL VALUES:					
T/K	Salinity /g kg ⁻¹	Solubility at H ₂ S fugacity of 1 atm /mol dm ⁻³	T/K	Salinity /g kg ⁻¹	Solubility at H ₂ S fugacity of 1 atm /mol dm ⁻³
275.25	9.972	0.1910	283.34	9.972	0.1496
	20.014	0.1878		20.014	0.1476
	24.958	0.1862		24.958	0.1466
	29.993	0.1846		29.993	0.1456
	34.994	0.1831		34.994	0.1447
	40.028	0.1816		40.028	0.1437
278.20	9.972	0.1741	288.19	9.972	0.1299
	20.014	0.1714		20.014	0.1284
	24.958	0.1701		24.958	0.1276
	29.993	0.1688		29.993	0.1269
	34.994	0.1675		34.994	0.1262
	40.028	0.1662		40.028	0.1255
Samples of seawater were acidified by adding 4 cm ³ of sulfuric acid (5 mol dm ⁻³) to 5 dm ³ of seawater before absorption of H ₂ S.					
AUXILIARY INFORMATION					
METHOD/APPARATUS/PROCEDURE: Acidified seawater was placed in a glass vessel. The liquid under test was deoxygenated by a stream of nitrogen. Hydrogen sulfide was then bubbled through the liquid for about 15 h. with continuous magnetic stirring. Gas flow rate was then reduced and use made of a shorter inlet tube so as to ensure that the pressure of the gas was within 0.5 mmHg of barometric pressure. After a further 2 h a sample of the liquid was analysed by iodimetry.			SOURCE AND PURITY OF MATERIALS: 1. from Air Products Ltd; purity > 99.6% 2. surface water from Irish Sea, salinity approx. 33‰; filtered; diluted or evaporated.		
			ESTIMATED ERROR: $\delta(\text{solubility}) = \pm 0.2\%$; $\delta P/\text{Pa} = \pm 70$; $\delta T/K = \pm 0.02$ (authors)		
			REFERENCES:		

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EXPERIMENTAL VALUES:

T/K	Salinity /g kg ⁻¹	Solubility at H ₂ S fugacity of 1 atm /mol dm ⁻³	T/K	Salinity /g kg ⁻¹	Solubility at H ₂ S fugacity of 1 atm /mol dm ⁻³	
293.25	9.972	0.1143	297.87	29.993	0.0995	
	20.014	0.1131			34.994	0.0990
	24.958	0.1126			40.028	0.0986
	29.993	0.1120	302.97	9.972	0.0907	
	34.994	0.1114			20.014	0.0898
297.87	40.028	0.1108		24.958	0.0894	
	9.972	0.1013		29.993	0.0891	
	20.014	0.1004		34.994	0.0887	
	24.958	0.0999		40.028	0.0884	

The authors found that solubilities were fitted to better than $\pm 0.5\%$ by the following equation developed by Weiss:

$$\ln C = A_1 + A_2(100/T) + A_3 \ln(T/100) + S^{\circ}/_{\circ\circ} [B_1 + B_2(T/100) + B_3(T/100)^2]$$

where C is the solubility in units of mol dm⁻³; T is the temperature in units of K; A₁ = -41.0563; A₂ = 66.4005; A₃ = 15.1060; B₁ = -0.60583; B₂ = 0.379753; B₃ = -0.602340 and S[°]/_{°°} is the salinity (g kg⁻¹).