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Reference Literature to the Critical Properties of Aqueous Electrolyte Solutions

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A comprehensive review is compiled of the published literature sources for the critical properties of aqueous electrolyte solutions.

The critical properties of binary and multicomponent systems have been extensively studied during the last 20 years; however, these investigations paid little attention to the critical phenomena in aqueous electrolyte solutions (see, e.g., ref 8, 18, 35, 50, 55, and 65). Particularly, the properties of the saturated solutions were omitted from the studies, despite the fact that scientists and engineers often require these properties in their work.

This article tabulates the references on these data. The references were obtained by searching the following:

Chemical Abstracts
Chemisches Zentralblatt
Citation Index
Dissertation Abstracts
Nuclear Science Abstracts
Physical Abstracts
Referativnyi Zhurnal

Furthermore, the listed references in several articles were examined for additional sources of relevant information.

The critical phenomena or the disappearance of the liquid–vapor meniscus has been measured experimentally for most pure compounds; however, the techniques for aqueous electrolyte solutions are more cumbersome. The difficulties arise from several sources: there are great differences between the critical properties of pure water and the pure inorganic salts, e.g., NaCl, Na_2SO_4, $CaCl_2$, etc; the apparatus has to be designed to tolerate high temperatures and pressures in addition to the corrosion resistance of the vessel; the critical temperature of these inorganic solids is in the range of 2500–3000°C; and the reliability of the calculated values (using the construction of rectilinear diameter in most cases) is fair, owing to the discrepancies between the derived values by various investigators.[52,53] This uncertainty justifies the belief that further studies are required for the establishment of more reliable data. How-

Table I. Bibliography of the Critical Properties of Inorganic Compounds–H_2O Systems

System:	Ref	System:	Ref	System:	Ref	System:	Ref
H_2O–	...	H_2CrO_4	30,34,40	H_2O–		NaI	21
$Al(OH)_3$	30,34,40	H_2MoO_4	30,33,34,40	Li_2SO_4	49,51,57,58,60	NaOH	30,34,37,40
$Al(ONa)_3$	30,34,40	H_2SO_4	47	Li_2SiO_3	30,40	$Na_2B_4O_7$	30,40,51
Ar	12,13,44,68,69	H_3BO_3	30,34,40,47	$MgCl_2$	47	Na_2CO_3	21,30,40,51,57, 58,63
B_2O_3	21	H_3PO_4	47	$Mg(OH)_2$	34		
CH_3COOH	47	KBr	40,47,71,72	$Mg(NO_3)_2$	47	$Na_2Cr_2O_7$	30,34,40
CO_2	1,3,11–13,16, 38–40,44, 67–70,79–81	KCl	20,21,26,27,31, 40,47,51,71,72	$MgSO_4$	73	Na_2MoO_4	30,34,40
				NH_3	1,12,44,45, 68–70,82	Na_2SO_4	21,29,51,57–59, 61,78,85
		KF	51				
$CaCl_2$	47	KI	21,40,47,71,72	NH_4Cl	47	Na_2SiO_3	30,31,34
$Ca(NO_3)_2$	21	$KLiSO_4$	57,58	NH_4HCO_3	47	$Na_4P_2O_7$	51
$CaSO_4$	78	K_2CO_3	30,40,51	$(NH_4)_2CO_3$	47	$NiSO_4$	48
$Cr_2(SO_4)_3$	32,40	$KHSO_4$	47	$(NH_4)_2SO_4$	47	$PbCl_2$	51
CsCl	51	K_2SO_4	51,57,58,62	N_2	1,11,13,56, 67–70,80,83	RbCl	40,51,71
$CsNO_3$	47	$K_2SO_4 \cdot Li_2SO_4$	84			SO_3	17,40,76,77
Cs_2SO_4	51			NaBr	21	SiO_2	3,10,12,22,30, 34,36,57,58, 66,78
D_2O	40,64	K_2SiO_3	30,40	NaCl	1,3–7,9,10,12, 15,21,23–29		
$Fe(OH)_3$	34	$K_2Si_2O_5$	21				
HCl	47	$K_4P_2O_4$	51		40–43,47,51,54, 57,69–72,74, 75,78,80	Tl_2SO_4	51
$HClO_4$	47	LiCl	47			UO_2SO_4	46,48
HNO_3	2,47	LiF	51			Xe	13,14
				NaF	51		

ever, future investigations and improvements should be based on the knowledge of the already available information.

As far as the critical properties of aqueous electrolyte solutions are concerned, there are two different types of systems. In the first group (e.g., $NaCl-H_2O$, NH_3-H_2O, $K_2CO_3-H_2O$, $Ca(NO_3)_2-H_2O$), there is a continuous critical line between the two pure compounds, i.e., between 0 and 100% solutions. In the second group of systems (e.g., $Na_2SO_4-H_2O$, SiO_2-H_2O, $Na_2CO_3-H_2O$), the critical curve is discontinued at the two end points, P and Q. At these points the critical curve intersects with the solubility curve.

A forthcoming article discusses the various experimental methods, theoretical aspects, and estimation or prediction methods for the critical properties of aqueous electrolyte solutions with illustrations.[19]

References on the critical properties of binary electrolyte solutions are presented in Table I. The inorganic compounds are listed in alphabetical order. Ternary and multicomponent systems were not included because of the unreliability of the few published data. Furthermore, the description of these systems does not provide a full picture of the four- or multidimensional model (pressure–temperature–concentration A–concentration B).

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A Survey of the Use of On-Line Computer-Based Scientific Search Services by Academic Libraries†

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To explore their use of on-line computer-based bibliographic search services, a one-page questionnaire was sent to 100 academic libraries in the United States having separate departmental chemistry or science libraries. An attempt was made to determine the background training of the persons performing the searches, who the end users were, the growth trend, the funding, the data bases used, and the value to the users. Of the 73 replies, 49.3% indicated use of such services, while 24.6% were planning to use them primarily by faculty and graduate students. Of those reporting, 83.3% used searchers with a background in library or information science; 47.2% had a background in scientific discipline. Two or more on-line services were used by 72.2%. A majority of respondents stated that the user paid all expenses or a portion of the expenses. The searches met the needs of the user most of the time in 83.3% of the cases, and all of the time in 5.4%.

A workshop was conducted in November 1973, by the University of Denver Research Institute, organized by the Office of Science Information Service, National Science Foundation, to identify the highest priorities in future research covering all aspects of uses and users of scientific and technical information systems and services.[1] Graduate students of science and engineering were identified as eventual heavy users. One proposed research project concerned the education of graduate students in the use of the nationally available systems, and raised the question of the extent of courses available for such training.

This study explores the impact of machine retrieval of bibliographic information in academic libraries, with special reference to scientific literature.

In order to assess the use of computer-based on-line scientific search services by academic libraries, a survey was made. A one-page questionnaire was designed and sent November 1974 to 100 colleges and universities in the United States which maintain separate libraries with collections covering chemistry or science and technology. The librarian at Washington University prepared a covering letter for the questionnaire explaining its purpose.

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The questionnaire was designed to determine the extent of use and consideration of use of on-line computer-based bibliographic services for obtaining scientific information in colleges and universities, and to determine who the end users of these services were, as well as determining if the end users were the persons performing the searches, or if the searches were being performed by intermediaries. The backgrounds of the persons actually performing the searches—reference librarians, subject specialists, or computer-trained personnel—were sought, as well as the extent of services offered, and the general growth trend. It was also designed to determine the magnitude and sources of funding, whether the searches met the needs of the requestors, the type of information requested, and to obtain general comments of library administrators regarding the success or failure of the use of these services. It was anticipated that possible application of the data derived from the questionnaire might be made by Washington University administrators in decisions to be made in offering computer-based search services. The following statistical information has been presented according to the organization of the questionnaire.

Of the 100 questionnaires sent to academic libraries, 73 replies were received. Of the 73 replies, 49.3% indicated they were using on-line computer-based information re-