MSA RESEARCH CORPORATION
TECHNICAL INFORMATION DIVISION

LIQUID METALS TECHNOLOGY ABSTRACT BULLETIN

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TECHNICAL INFORMATION DIVISION

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This is the fifteenth issue of a series of abstract bulletins covering current literature on liquid metals. These bulletins are prepared by the Technical Information Division as a service to industries engaged in related research and development programs.

The growing interest in liquid metals technology has led to an increased amount of literature published on the subject. MSA Research Corporation, as a pioneer in liquid metals technology, feels that other interested companies can benefit from a current and up-to-date abstract bibliography on liquid metals literaure.

These bulletins will be issued at approximate quarterly intervals, depending upon the volume of literature to be covered. Existing abstracts will be used unless they are not adequate with respect to the subject scope.

Interested parties may be placed on the mailing list by writing to MSA Research Corporation, Document Control, Callery, Pa.

Sodium Components Test Facility 1

Atomic Power Development Associates, Inc., Detroit
APDA-134, Nov. 1959, 208 p. Contract AT(11-1)-772
NSA 14:10545

The design and construction of a test facility that will be capable of subjecting sodium components to both steady state and transient conditions expected in full size nuclear power electric generating stations are presented. This study encompasses design criteria, an estimate of time required to construct, and survey of existing facilities to be selected by mutual agreement of the commission and APDA which would be suitable to accommodate the desired tests.

Mass Transfer in Liquid-Lithium Systems 2

Gill, William N., Vanek, Richard P., Jelinek, Robert V. and Grove, C. S., Jr. (Syracuse University, New York)
AIChE Journal, 6, 139-44 (March 1960)
NSA 14:10759

The behavior of Type 304 stainless steel in a forced-convection closed-loop lithium system was investigated over a wide range of temperatures and velocities. Fundamental information concerning the mechanism for mass transport was obtained by examining solution and deposition effects along flat plates. The rate-determining process for solution is transport from the solid to the interface, whereas deposition rates are liquid-phase controlled. Liquid-phase mass transfer coefficients were correlated with a maximum deviation of approximately 15% by the use of van Kàrmàn's analysis of the turbulent boundary layer along a flat plate, combined with the Chilton-Colburn empirical modification of the Schmidt group. Mean values of the solution rate constant ranged from 0.154 to 0.750 x 10^{-5} cm/sec at 510 to 612°C. These values are on the order of 10^3 smaller than corresponding liquid-phase mass transfer coefficients.

Liquid Metal Cavitation Problems and Desired Research 3

Hammitt, Frederick G.
American Society of Mechanical Engineers, Paper No. 60-HYD-13, 1960, 7 p.
Rev. of Met. Lit. 17:5

Cavitation of liquid Na, K, Rb, Na-K alloys, Hg, Bi and Pb-Bi alloys as heat-engine fluids versus H_2O. Temperature, density of liquid, density of vapor, viscosity, surface tension, heat capacity latent heat, thermal conductivity, vapor pressure and bulk modulus. (R2m, 14-60, Hg, Na, Na-b, Bi, Pb-b).

Liquid Metal Fuel Reactor Experiment. Cavitation by Bismith 4

Hovanec, F. L.

B&W-1089, Dec. 1959, 46 p. Contract AT(30-1)-1940
NSA 14:9712

Croloy 2-1/4 was tested to determine the causes and effects of cavitation in dynamic liquid bismuth solutions. Velocity and static pressure were of primary concern although some attention was given to viscosity, metallurgical treatment, surface finish, and corrosion inhibitors. The results indicate: cavitation damage increases with velocity; metal damage decreases with increased static pressure; there is a correlation between oxidation and cavitation but the relationship is not clear; corrosion inhibitors reduce cavitation damage, suggesting that cavitation entails concurrent chemical-mechanical attacks; and cavitation attacks show no preference for a particular heat treatment or weld process.

Transient Pressures Developed by Sodium-Nitric Acid Reactions 5

Huck, C E. and Shefcik, J. J.

General Electric Co., Hanford Atomic Products Operation, Richland, Washington
HW-62450, 21 October 1959, 4 p. Contract AT(45-1)-1350
NSA 14:6194

Scouting studies were made to determine hydraulic pressures developed when Na is exposed to cold concentrated HNO_3 beneath the liquid surface. The peak hydraulic pressures developed when Na reacted beneath eight feet of cold 60% HNO_3 were 250, 700, and 850 psi for four, eleven, and twenty-two grams of Na, respectively. The peak pressures persisted for about 0.5 milliseconds. As many as seven pressure peaks were observed for a single reaction with the highest peak at or near the beginning of the reaction. The force developed when the largest quantity of Na reacted was sufficient to displace the 700-pound dissolver assembly about one foot horizontally.

Liquid Metal Technology - A Literature Search 6

Jacobs, James M., Comp.

Technical Information Service Extension, AEC
TID-3544, January 1960, 27 p
NSA 14:8679

Two hundred seventeen references to unclassified reports and published literature on liquid metal technology are presented.

Purification of Sodium from Oxides and Methods of Oxide Content Control 7

Kirillov, P. L., Kozlov, F. A., Subbotin, V. I. and Turchin, N. M.

Atomnaya Energ. 8, 30-6 (1960) January (in Russian)
NSA 14:10412

Oxides in sodium coolants induce corrosion in the system and cause plugging. Data are given from tests made with cold traps for catching oxides. The data are useful in designing experimental and industrial installations using sodium and sodium-potassium coolants.

Heat and Mass Transfer Analysis of Proposed Experimtnatl Cold Trap System 8

McDonald, J. S. and Perez, F.

Atomics International Div., North American Aviation, Inc. Canoga Park, Calif.
NAA-SR-Memo-4578, 29 October 1959, 28 p.
NSA 14:6755

Studies were made to investigate the possibility of removing oxide impurities from Na-cooled reactor systems by cold trapping in conjunction with fill-drain tanks.

The Large Component Test Loop 9

Strahl, H.

Atomics International Div., North American Aviation, Inc. Canoga Park, Calif.
NAA-SR-4386 Mar. 1, 1960, 19 p. Contract AT(11-1)Gen-8
NSA 14:9737

A large-scale loop complex for proof testing reactor components in sodium under simulated reactor operating conditions has been constructed. The system is capable of circulating sodium at variable flow rates to 1200 gpm with temperatures up to 1000 F. Thermal shock tests may be conducted to simulate reactor scram conditions with temperature differences up to 500 F.