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onr ltr, 4 may 1977

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QUARTERLY LETTER REPORT

GOVERNING

January 1, 1964 -- March 31, 1964

THERMODYNAMIC PROPERTIES
OF
BIMETALLIC COMPOUNDS,

Mr. Ludwig Fasolino
-El 4-5400 Ext. 320

Contract Number: Nonr-3608(00)
ARPA Order Number: 23-61
Project Code Number: 3910
Contract Date: 15 September 1961
Expiration Date: 14 November 1964
Contract Amount: $233,769.00

Approved by
Allen L. Klibanoff
Program Director

Reviewed by:
Frank J. Salomone
Contracts Manager

Submitted to:
Advanced Research Projects Agency
The Pentagon, Room 3D-159
Washington 25, D. C.

Attn: Advanced Propellant
Chemistry Office
MAJOR ACCOMPLISHMENTS

SOLUTION CALORIMETRY

A. Calibration

The silvered, dewar-type reaction vessel in which the heats of solution of $B_2O_3$ (amorphous), $B_2O_3$ (crystalline), and $H_3BO_3$ are to be measured was electrically calibrated under adiabatic conditions, giving an energy equivalent, $\varepsilon = 2.946 \pm 0.004 \text{ cal/ohm}$.

B. Heat of Solution of $B_2O_3$ (amorphous)

Prior to sealing, each sample was dried at 200°C under vacuum. Five determinations of the heat of solution of amorphous $B_2O_3$ in water were made yielding the following results:

$$\Delta H_{298} = -7.737 \pm 0.049 \text{ kcal/mole}$$

C. Heat of Solution of $H_3BO_3$

Prior to sealing, each of the samples was dried over magnesium perchlorate overnight. Five determinations of the heat of solution gave,

$$\Delta H_{298} = +5.094 \pm 0.006 \text{ kcal/mole}$$

All of the precision errors listed above were calculated as twice $\sigma$.

D. Preparation of Crystalline $B_2O_3$

Crystalline $B_2O_3$ was prepared by heating a seeded quantity of $H_3BO_3$ to 260°C for 36 hours or longer. The solidified product will next be pulverized and analyzed prior to sample preparation.
PROBLEMS ENCOUNTERED

None

ACTION REQUIRED BY ARPA

None

FUTURE PLANS

The heats of solution of crystalline $B_2O_3$ is to be measured next. Following this, the heats of solution of $BCl_3$ and $BF_3$ will be measured.

Upon completion of the heat of solution of crystalline $B_2O_3$, a special report will be written covering the details of the work thus far which will have enabled the determination of the heats of formation of $B_2O_3$ (crystalline) and $B_2O_3$ (amorphous), and the energy of transformation, $B_2O_3$ (crystalline) $\rightarrow$ $B_2O_3$ (amorphous).