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MOUND LABORATORY MONSANTO
Central File No. 62-11-62

November 5, 1962

Dr. O. J. Wick
General Electric Company
P.O. Box 100
Richland, Washington

Dear Doctor Wick:

I am enclosing three graphs which illustrate the measurements performed at Mound Laboratory on a plutonium alloy containing one weight per cent gallium prepared at the Rocky Flats Plant. This is the material that I discussed with you briefly at Hanford. Some recent data acquired since that time are included.

The differential thermal analysis trace recorded as this alloy was heated above room temperature shows that no transformation occurs until the alloy temperature reaches 396°C. Following this transformation, the trace indicates transformations which are identified as the start of the delta to epsilon transformation at 508°, the completion of this transformation at 576°, the start of melting at 623° and the completion of melting at 660°. All of these transformations are in agreement with the LASL phase diagram except for the transformation at 396° and the lowering of the melting point to 623°.

The specific heat data, obtained from the high-temperature calorimeter, further illustrates the abnormal phase transformation at 396°. The graph of this data shows that the difference in the specific heat of the two phases above and below 397° is very small. The appreciable heat of transformation measured at 397°, 28 calories/gram-atom, indicates that a first-order phase transformation occurs at this temperature.

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A DTA trace recorded as the alloy was rapidly cooled to liquid nitrogen temperature, -196°, and allowed to slowly warm to room temperature is included. Reliable results were obtained only from the heating curves. A definite phase transformation is observed which starts at -40° and peaks at -32°. An inflection in the DTA curve noted at -6° offers the possibility that another phase transformation which involves a small amount of heat may occur at this temperature.

In summary, abnormal phase transformations have been established at 397°C and between -40° and -32°C. Impurities may be the cause of these transformations. We are attempting some analytical studies of this alloy. We are starting some studies that involve the addition of specific impurities to good plutonium. I would like to make arrangements to get some of the high density material that Tom Nelson told me about when I visited him.

Very truly yours,

Original Signed By
Lerroy V. Jones

Lerroy V. Jones, Director
Technical Support Department

LVJ:elt

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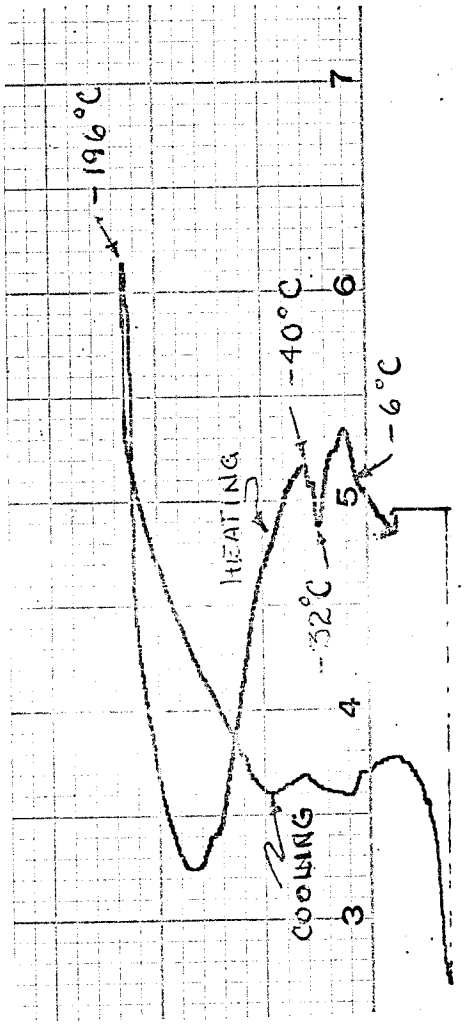

LOW TEMPERATURE DTA STUDY

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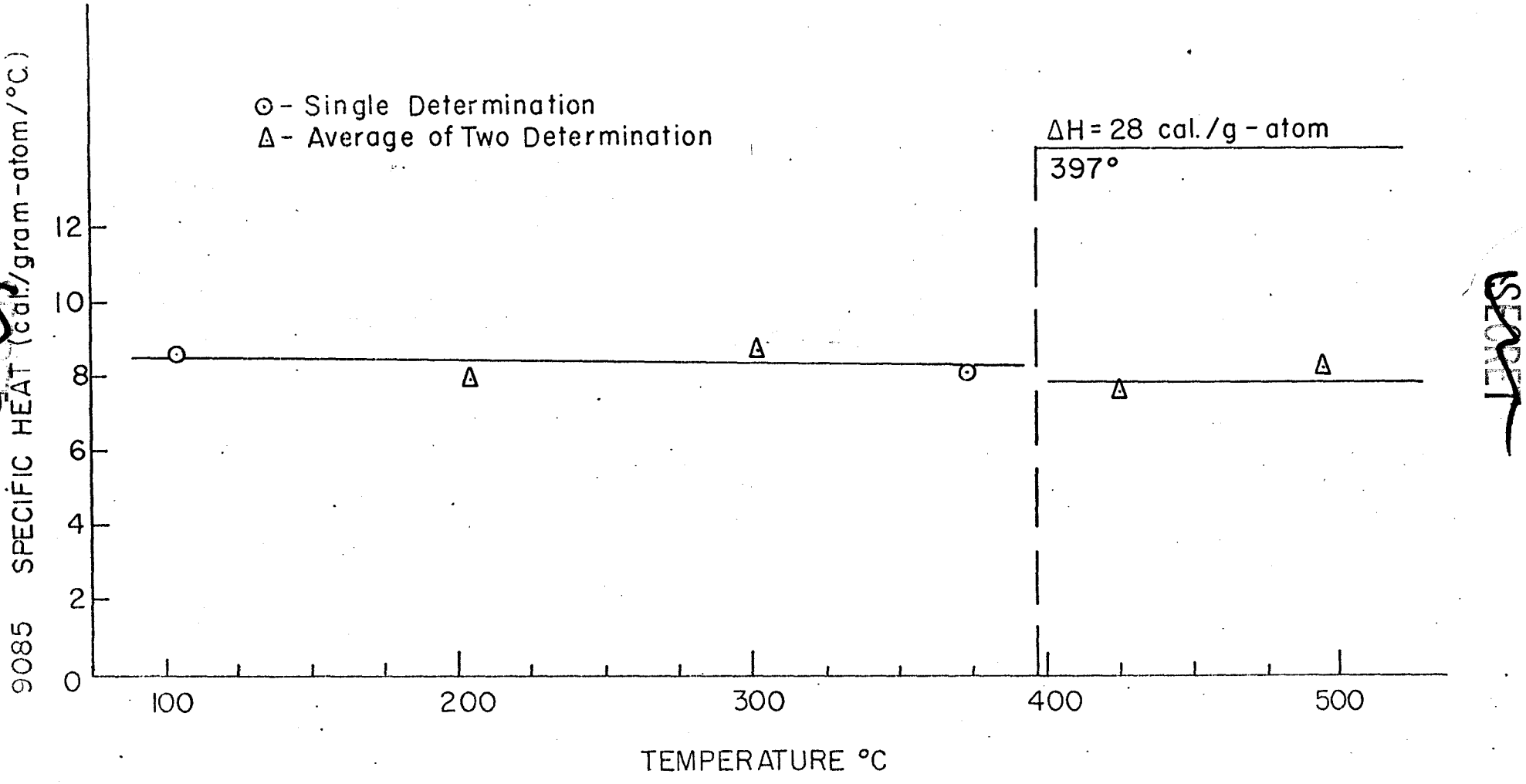
SPECIFIC HEAT OF Pu – 1(ω)/O Ga. ALLOY



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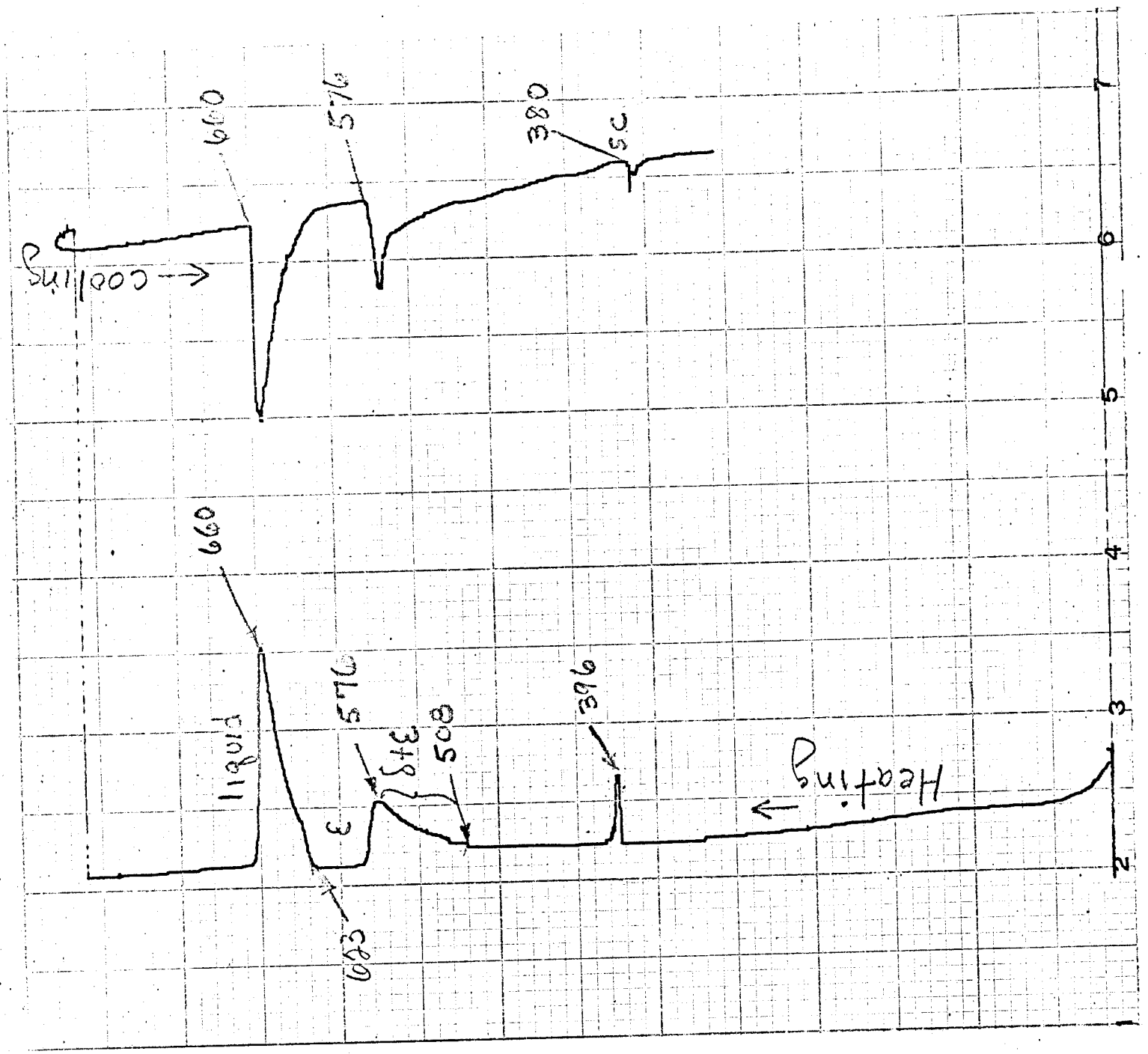

HIGH TEMPERATURE DTA STUDY