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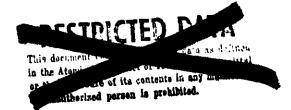
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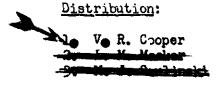
March 29, 1961

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COMMENTS ON METAL REDUCTION

It has been reported that Y-12 is firing reduction charges by means of a chemical initiator. This technique has been reported in the literature. The following is quoted from WUranium Production Technology, by Harrington and Ruehle of the Mallinckrodt Chemical Works:

alag completely fuse even when the charge is ignited at 0°C if calcium is used as the aductant. ----- However, with fractional kilogram quantities, heat losses upon firing become too great, and therefore the charges must be preheated.

reductions. The reaction may be started electrically (1) by a magnesium ribbon burned in a suitable primer, such as a mixture of magnesium and sodium peroxide chips, or by dropping in an ignited pellet of potassium nitrate and lactose mixture (2) The reaction is self-sustaining and rapid. It is accompanied by an evolution of gas and small particles; therefore, it is conducted in a shielded firing chamber. The uranium is protected from oxidation, first by a blanket of calcium vapor in the early stage of the reduction, and later by molten calcium fluoride.

When the reaction is complete, the products are allowed to cool under an argon atmosphere.



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COMMENTS ON METAL REDUCTION (Continued)

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Whall-scale meducations are conducted in sealed bombs. Residual or is first removed from the system by on ignor as pulse. Then the bomb and its contents pe he ded at a paedetermined ate until ignition takes place. Iodine may be added to the charge to incresse the heat available during ignition and to yield a lower melting mode fluid slag. In fractional kilogram reductions 0.15 mols per mol of unimium are sufficient to obtain good metal **∌**ields.**©**⊚

The pos and cons of chemical ignition as temperature ignition 🔐e 🔊 discusse. Chermodynamics

indicate the reactions to be very similar, with somewhat bighes best Colution in the Qu reaction. This latter fast might result in more critical effect from iodine added to the unanium reaction mixture.

© I2 ---- CaI2

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AH₂₉₈ = - ₩8 k cal/mol

Currently we are using 0.1 mol I2 per mol of Bu. We have tested meduction with no I2 added grocess Test 9925 T. Minetyesix charges fired with no I2 resulted in no significant difference in yield. The buttons were of good quality, with no difference in appearance from those of charges with I2. Although it was concluded that reduction without I2 was satisfactory operator opinion was that buttons with I2 were removed from the slag and crucible more easily.

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COMMENTS ON METAL REDUCTION (Continued)

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SRP, using the reaction:

PuF₃ + 302 \bigcirc ---- 3/2 CaF₂ + Pu \bigcirc H₂₉₈ = -60 k cal/molused o.6 mols I₂ per mol Pu. More recently, the PuF₃ is being oxidized to 3/4 PuF₄ + $\frac{1}{4}$ PuO₂. SRP reports this mixture is being fired without I₂, with yields of [bout 96 percent] and that the buttons are removed more easily the then is it used. The bove feation with high PuO₂ is

- Set has Seen secretary flats uses no in their seduction sharpes sowers in have no first hand information. No data are evailable from other sites to allow comparison of quality comparison of the verage HAPO-shipped quality is u.h.
- appeared to have any elvantage at HAPO and since elimination of I₂ has been demonstrated should such advantage materialize that the addition of chemical igniters is not elvantageous and could result in lower quality due to the introduction of foreign material into the charge.

 Olt is possible that the use of a chemical igniter could result in a shorter time cycle due to ignition at lower temperatures. Lower

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COMMENTS ON METAL REDUCTION (Continued)

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temperatures, however, should again result in buttons of lesser quality and lower yields. The heat evolved from the igniter may be sufficient to maintain the higher temperatures.

The data colinated dufing the notionine muns is being exercised and it is dikely that the test will be expected in the process of EVOR testing.

References:

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