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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF MINES

ROLLA METALLURGY RESEARCH CENTER

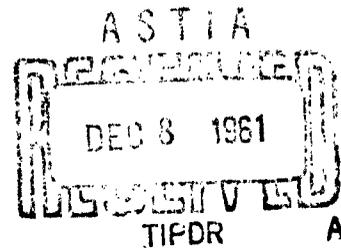
VAPOR DEPOSITION OF TUNGSTEN  
AND  
THE EFFECTS OF PROCESS VARIABLES

Monthly Report of Progress  
on Order No. IPR SP-6-62-4

for

Special Projects Office  
Department of the Navy  
Washington 25, D.C.

CATALOGED BY ASTIA  
AS AD NO. 267500



Report No. 1  
Date November 1961

VAPOR DEPOSITION OF TUNGSTEN AND THE EFFECTS  
OF PROCESS VARIABLES

Monthly Progress Report No. 1  
November 1961

Department of the Navy Order No. IPR SP-6-62-4

Abstract

Experimental work on tungsten-coating rocket nozzle inserts was resumed under Work-Order IPR SP-6-62-4, Special Projects Office, Department of the Navy. Studies were initiated on the effects of tungsten vapor-deposition variables.

VAPOR DEPOSITION OF TUNGSTEN AND THE EFFECTS  
OF PROCESS VARIABLES

Monthly Progress Report No. 1  
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Department of the Navy Order No. IPR SP-6-62-4

A. Background

On September 25, 1961, a work-order numbered IPR SP-6-62-4 was issued by the Department of the Navy, Special Projects Office, Washington, D. C., to the Bureau of Mines, U. S. Department of the Interior, Washington, D. C. This work-order included tungsten-coating of rocket nozzle inserts, furnishing consulting service to the Aerojet-General Corporation, Azusa, California, for deposition of tungsten on POLARIS nozzle components, and continuing basic investigations of tungsten vapor-deposition process variables.

One graduated tungsten-beryllia MERM nozzle and four Atlantic Research Corporation graphite nozzles are to be coated with tungsten by the Bureau of Mines vapor-deposition procedure.

B. Program Objective and Scope

One of the objectives is to vapor-deposit 0.06-inch coatings of high-purity tungsten from tungsten hexafluoride on the following nozzle inserts:

One (1) tungsten-beryllia MERM nozzle insert furnished by the National Beryllia Corporation, Haskell, New Jersey.

Four (4) standard graphite test inserts furnished by the Atlantic Research Corporation, Alexandria, Virginia, as per A.R.C. drawing No. A20728.

Other objectives include continuation of consulting services to the Aerojet-General Corporation, Azusa, California, for vapor-deposition of tungsten on POLARIS nozzle components, and continuance of basic investigations of tungsten vapor-deposition variables, including temperature, time, pressure, flow rates, reactant purity, and coating properties including hardness, mechanical strength, and microstructure.

C. Program Status

At the request of the Aerojet-General Corporation, an engineer from the Rolla Metallurgy Research Center attended a Coordination Meeting on Vapor Deposition of Tungsten Processes at Azusa, California, on October 31.

Six tungsten cylinders were vapor-deposited at different temperatures under atmospheric pressure and constant ratio and flow rate of reactant gases. These cylinders were submitted for qualitative and quantitative spectrographic analyses and for metallurgical examination. Reports covering these examinations are pending.

A member of the technical staff of the Rolla Metallurgy Research Center visited the Aerojet-General Corporation plant at Azusa, California, on November 13 to 18, 1961. The purpose of this visit was to act in an advisory capacity for tungsten-coating full-scale POLARIS nozzle inserts by the procedure developed in the Rolla laboratories.

Arrangements were made to tungsten-coat a graphite model of the tungsten-beryllia nozzle insert to determine suitable time of deposition and flow rate of the reactant gases.

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F. W. Hoertel, Metallurgist

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J. A. Rowland, Research Director  
Rolla Metallurgy Research Center

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