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DATE: November 17, 1952

SUBJECT: Report on Results of Impact Tests Performed
 on Ti 75A and on Iodide Titanium Specimens.

TO: E. C. Miller

FROM: W. J. Fretague

COPY NO.

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OAK RIDGE NATIONAL LABORATORY
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OAK RIDGE, TENN.

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TO E. C. Miller
LOCATION
From W. J. Fretague
ATTENTION
COPY TO

DATE November 17, 1952

ANSWERING LETTER DATE

Report on Results of Impact

SUBJECT Tests performed on Ti 75A and
on Iodide Titanium Specimens.

Commercial Titanium

Impact tests were performed on four modified Izod type impact specimens of commercial titanium (Ti 75A Item 24 Heat L782).

Prior to impact testing these specimens were exposed in a 347 stainless steel loop ("A" loop) at Y-12 (9204-1). The following table lists the test history of the specimens prior to impact testing.

Test History

<u>Solution</u>	<u>Gas Pressurizing</u>	<u>Temperature</u>	<u>Hours</u>
UO ₂ SO ₄ (300 gU/liter)	200 psi H ₂ ; 100 psi O ₂	250°C	671

Samples from each specimen have been submitted for H₂, O₂ & N₂ by the vacuum fusion method.

The following table gives the results obtained from impact tests on the above impact specimens. The data is plotted on the figure accompanying this report.

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Specimen	Notch	Scale Used (in lbs)	Temperature (°C)	Impact Energy (in lbs)
2	1*	0 - 100	- 90	11.5
	2	0 - 50	/190	47.7
	3	" "	/120	36.2
	4	" "	/110	35.5
	5	" "	/100	31.0
	6	" "	/ 90	28.2
	7	" "	/ 80	20.6
	8	" "	/ 70	16.0
	9	" "	/ 50	16.6
	10	" "	/ 40	10.5
4	1*	0 - 100	- 90	10
	2**	0 - 50	/170	50/
	3	" "	/140	48.2
	4	" "	/120	42.8
	5	" "	/110	39.5
	6	" "	/100	34.5
	7	" "	/ 80	22.2
	8	" "	/ 60	12.5
	9	" "	/ 20	8.5
	10	" "	- 10	5.0
8	1*	0 - 100	- 90	7.5
	2	0 - 50	/160	45.0
	3	" "	/130	35.5
	4	" "	/120	35.3
	5	" "	/100	34.0
	6	" "	/ 90	25.2
	7	" "	/ 80	17.5
	8	" "	/ 30	6.3
	9	" "	0	5.5
	10	" "	/ 10	4.5
1	1*	0 - 100	- 90	25
	2*	0 - 100	- 20	7
	3	0 - 50	/180	48.7
	4	" "	/150	43.0
	5	" "	/130	38.5
	6	" "	/110	38.0
	7	" "	/100	34.8
	8	" "	/ 90	26.7
	9	" "	/ 70	20.7
	10	" "	/ 60	14.3

* The 1" end on all specimens were threaded so that they could be screwed into the corrosion testing fixture. This thread extends 3/16" from the end of the specimen. Since the hammer on the pendulum strike the specimen approximately 7/8" above the center line of the notch the hammer is actually striking the specimen on the threaded portion. For this reason the impact values listed for the #1 break (or notch) should be regarded as qualitative.

** Specimen 4 break #2 (or notch #2) did not break at the first impact of the striking hammer. It was necessary to drop the hammer a second time to fracture the specimen. Consequently the impact energy required to break the specimen can only be expressed as 60/100 lbs.

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Iodide Titanium

Impact tests were performed at three different temperatures on six iodide titanium specimens representing six different melts. All specimens, except I-1A were vacuum annealed at 500°C for 1 hr. and furnace cooled following swaging and prior to machining. Specimen I-1A was vacuum annealed at 950°C for 1 hr. and furnace cooled following swaging and prior to machining.

The following table lists the results obtained from the impact tests. The data is plotted on the figure accompanying this report. (Data for I-1A does not appear)

Specimen	Notch	Scale Used (in lbs)	Temperature (°C)	Impact Energy (in lbs)
I-6-1	1	0 - 100	/ 20	47.0
	2	" "	-195.8	38.5
	3	" "	- 90	45.2
I-5-2	1	" "	/ 20	61.5
	2	" "	-195.8	45.0
	3*	" "	- 90	73.5
I-4-2	1	" "	/ 20	56.7
	2	" "	-195.8	24.0
	3	" "	- 90	51.2
I-3-2	1	" "	/ 20	52.0
	2	" "	-195.8	21.2
	3	" "	- 90	41.0
I-2A	1	" "	/ 20	33.0
	2	" "	-195.8	13.0
	3	" "	- 90	21.5
I-1A	1**	" "	/ 20	98.0
	5**	" "	-195.8	99.0

* The unusually high impact value obtained on specimen I-5-2 at - 90°C can be attributed to the fact that an oil leak in the hydraulic system actualing the specimen vise caused the clamping pressure on the specimen to be low.

** In both cases (/ 20°C / -195.8°C) the impact specimen did not break but only bent down enough to allow the striking hammer to pass over it.

On the basis of the impact data collected it appears that the longer exposure in high concentration solution has not affected the transition temperature appreciably. Metallographic examination of a specimen tested in UO_2SO_4 solution for a shorter period revealed that the 500°C vacuum anneal is not causing complete recrystallization of the commercial titanium. The next problem is to determine the recrystallization temperature of Ti 75A and then anneal several specimens at this temperature and determine the transition temperature. It is suspected that the transition temperature of recrystallized Ti 75A will be lower than that previously determined.

Six 10-3/4" long iodide titanium specimens have been delivered to the Research Shops to have the ends threaded. When the machining operations are completed these six specimens will be delivered to the corrosion group at Y-12 for corrosion testing.

A sample of iodide titanium specimen I-1A has been submitted for H_2 , O_2 & N_2 analysis by the vacuum fusion method. It is suspected that the higher annealing temperature employed on specimen I-1A (950°C vs. 500°C) has removed more hydrogen and this is reflected in the higher impact values obtained.

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