

JAPAN RADIOISOTOPE ASSOCIATION

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TEST REPORT

This is a test report on ionization type smoke detector, performed by JRJA.

1 Test sample

- 1.1 Name : Smoke detector
- 1.2 Type : MODEL CPD 7051
- 1.3 Manufacturer : NOHMI BOSAI LTD.
- 1.4 Number of sample : 2
- 1.5 Sample No. : No.1 and No.2
- 1.6 Radiation source equipped in the detector :
 - Nuclide : ^{241}Am
 - Manufacturer : AEA TECHNOLOGY.
 - Activity : 29.6kBq
 - Code : AMMK7544

2 Test

2.1 Dose Rate Measurements :

This measurement is done along six directions i. e. front, back, and side A to D as shown in Fig. 1, at the distance of 5cm and 25cm from the surface of the detector to the assembly of specimen.

2.2 Drop Test :

A smoke detector assembly is subjected to the test once dropping to freely from a height of 10m onto the concrete target.

After the test, the specimen is subjected to visual inspection and leakage assessment of activity by wipe test method.

2.3 Heat Test :

A source holder, containing a 29.6kBq ^{241}Am source is put into a quartz tube, inserts into a preheated electric furnace and keeps at 600°C for 60 minutes in nitrogen atmosphere. The exhaust gas is led to 3 liquid traps containing

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0.01N HCl solution connected in series. (Fig. 2)

The quartz tube with the specimen is taken out of the furnace, leaves to cool to room temperature under stream of nitrogen. Then the specimen is subjected to visual inspection and leakage assessment of activity.

The activity leakage assessment is made by wipe test method, and moreover, the inner surface of the quartz tube is rinsed with 0.01NHCl solution. Both the rinsing solutions and the trapping solutions are also subjected to the measurement of alpha emitter.

Temperature variation inside the furnace is successively monitored during the test. (See Table1-1. and Table1-2.)

3 Results

3.1 Dose Rate Measurements :

The results are listed in Table 2.

Table 2.

Sample No.1

Direction		Dose rate	
		Ditector-to-surface distance 5cm	Ditector-to-surface distance 25cm
Front		$2.5 \times 10^{-2} \mu \text{ Sv / h}$	$1.9 \times 10^{-3} \mu \text{ Sv / h}$
Back		$6.7 \times 10^{-3} \mu \text{ Sv / h}$	$6.3 \times 10^{-4} \mu \text{ Sv / h}$
Side	Direction A	$5.9 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit
	Direction B	$6.3 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit
	Direction C	$4.3 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit
	Direction D	$4.4 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit

Detection limit : $9.2 \times 10^{-5} \mu \text{ Sv/h}$

Sample No.2

Direction		Dose rate	
		Ditector-to-surface distance 5cm	Ditector-to-surface distance 25cm
Front		$2.3 \times 10^{-2} \mu \text{ Sv / h}$	$1.6 \times 10^{-3} \mu \text{ Sv / h}$
Back		$6.2 \times 10^{-3} \mu \text{ Sv / h}$	$4.6 \times 10^{-4} \mu \text{ Sv / h}$
Side	Direction A	$3.7 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit
	Direction B	$4.3 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit
	Direction C	$4.8 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit
	Direction D	$6.8 \times 10^{-4} \mu \text{ Sv / h}$	Under detection limit

Detection limit : $9.2 \times 10^{-5} \mu \text{ Sv/h}$

3.2 Drop Test :

a) Visual Inspection

A part of the outermost cover of the detector was broken and the central disc part together with insect screen and a shield disc was detached from the body. No remarkable damage was found in the inner part. (Fig. 3 to Fig. 6)

b) Leakage Assessment of the Activity

The results are listed in Table 3.

Table 3.

Sample No	Activity
No.1	Under detection limit
No.2	Under detection limit

Detection limit : 0.16Bq

3.3 Heat Test :

a) Visual Inspection

The specimen was generally discolored but showed no sign of damage such as melting or deformation as shown in Fig. 7 and Fig. 8.

b) Leakage Assessment of the Activity

The results are listed in Table 4.

Table 4.

Sample No.	trapping solutions(1)	trapping solutions(2)	trapping solutions(3)	trapping solutions(4)	Wipe test
No.1	Under detection limit ¹⁾	Under detection limit ²⁾	Under detection limit ³⁾	Under detection limit ⁴⁾	Under detection limit ⁵⁾
No.2	Under detection limit ⁶⁾	Under detection limit ⁷⁾	Under detection limit ⁸⁾	Under detection limit ⁹⁾	Under detection limit ¹⁰⁾

Detection limit : 1) 3.2Bq/g 2) 2.4Bq/g 3) 2.4Bq/g 4) 2.4Bq/g 5) 0.16Bq

6) 3.2Bq/g 7) 2.4Bq/g 8) 2.4Bq/g 9) 2.4Bq/g 10) 0.16Bq

Tested by T. HAGIWARA & A. SAITO

Division Of Radioisotopes Technical Section

T. Hagiwara A. Saito

Date 6/11/2002

Approval by T.KIMURA

Manager, Radioisotopes Technical Section

T. Kimura

Date 6 November 2002

Table.1-1 Recording Chart of Furnace Temperature

02. 10. 17

AUTO 1min

IN →

13:18:40	91.6℃
13:19:40	105.9℃
13:20:40	137.9℃
13:21:40	168.1℃
13:22:40	196.7℃
13:23:40	224.1℃
13:24:40	251.5℃
13:25:40	278.8℃
13:26:40	305.7℃
13:27:40	333.3℃
13:28:40	360.3℃
13:29:40	387.1℃
13:30:40	413.6℃
13:31:40	439.9℃
13:32:40	465.6℃
13:33:40	490.4℃
13:34:40	515℃
13:35:40	539℃
13:36:40	562℃
13:37:40	585℃
13:38:40	608℃
13:39:40	630℃
13:40:40	617℃
13:41:40	635℃
13:42:40	641℃
13:43:40	639℃
13:44:40	638℃
13:45:40	639℃
13:46:40	642℃
13:47:40	643℃
13:48:40	641℃
13:49:40	641℃
13:50:40	642℃
13:51:40	642℃
13:52:40	643℃
13:53:40	643℃
13:54:40	643℃
13:55:40	643℃
13:56:40	643℃
13:57:40	643℃
13:58:40	643℃
13:59:40	643℃
14:00:40	643℃
14:01:40	643℃
14:02:40	644℃
14:03:40	644℃
14:04:40	644℃
14:05:40	644℃
14:06:40	644℃
14:07:40	644℃

OUT →

14:08:40	644℃
14:09:40	644℃
14:10:40	644℃
14:11:40	644℃
14:12:40	644℃
14:13:40	644℃
14:14:40	644℃
14:15:40	644℃
14:16:40	644℃
14:17:40	643℃
14:18:40	644℃
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14:45:40	641℃
14:46:40	641℃
14:47:40	641℃
14:48:40	641℃
14:49:40	634℃
14:50:40	627℃
14:51:40	621℃
14:52:40	615℃
14:53:40	611℃
14:54:40	606℃
14:55:40	602℃
14:56:40	597℃
14:57:40	592℃
14:58:40	588℃
14:59:40	584℃
15:00:40	580℃
15:01:40	575℃
15:02:40	571℃
15:03:40	567℃

Table:1-2 Recording Chart of Furnace Temperature

02. 10. 18					
AUTO 1min					
	14:15:02	203.3°C	15:04:02	626°C	
	14:16:02	233.3°C	15:05:02	626°C	
	14:17:02	262.4°C	15:06:02	625°C	
	14:18:02	291.0°C	15:07:02	625°C	
	14:19:02	320.0°C	15:08:02	625°C	
	14:20:02	348.2°C	15:09:02	625°C	
	14:21:02	376.1°C	15:10:02	624°C	
	14:22:02	403.1°C	15:11:02	624°C	
	14:23:02	430.2°C	15:12:02	624°C	
	14:24:02	456.5°C	15:13:02	624°C	
	14:25:02	482.0°C	15:14:02	624°C	
	14:26:02	507°C	15:15:02	623°C	
	14:27:02	531°C	15:16:02	623°C	
	14:28:02	555°C	15:17:02	623°C	
	14:29:02	578°C	15:18:02	623°C	
	14:30:02	601°C	15:19:02	622°C	
	14:31:02	614°C	15:20:02	622°C	
	14:32:02	606°C	15:21:02	621°C	
IN →	14:33:02	623°C	15:22:02	621°C	
	14:34:02	618°C	15:23:02	621°C	
	14:35:02	618°C	15:24:02	621°C	
	14:36:02	620°C	15:25:02	621°C	
	14:37:02	623°C	15:26:02	620°C	
	14:38:02	626°C	15:27:02	620°C	
	14:39:02	626°C	15:28:02	620°C	
	14:40:02	628°C	15:29:02	620°C	
	14:41:02	628°C	15:30:02	620°C	
	14:42:02	628°C	15:31:02	620°C	
	14:43:02	627°C	15:32:02	619°C	
	14:44:02	627°C	15:33:02	619°C	
	14:45:02	628°C	15:34:02	619°C	
	14:46:02	628°C	15:35:02	618°C	
	14:47:02	628°C	15:36:02	616°C	
	14:48:02	629°C	15:37:02	608°C	
	14:49:02	629°C	OUT →	15:38:02	602°C
	14:50:02	629°C		15:39:02	597°C
	14:51:02	630°C		15:40:02	592°C
	14:52:02	630°C		15:41:02	587°C
	14:53:02	631°C		15:42:02	583°C
	14:54:02	631°C		15:43:02	578°C
	14:55:02	630°C			
	14:56:02	629°C			
	14:57:02	629°C			
	14:58:02	628°C			
	14:59:02	628°C			
	15:00:02	628°C			
	15:01:02	627°C			
	15:02:02	627°C			
	15:03:02	626°C			

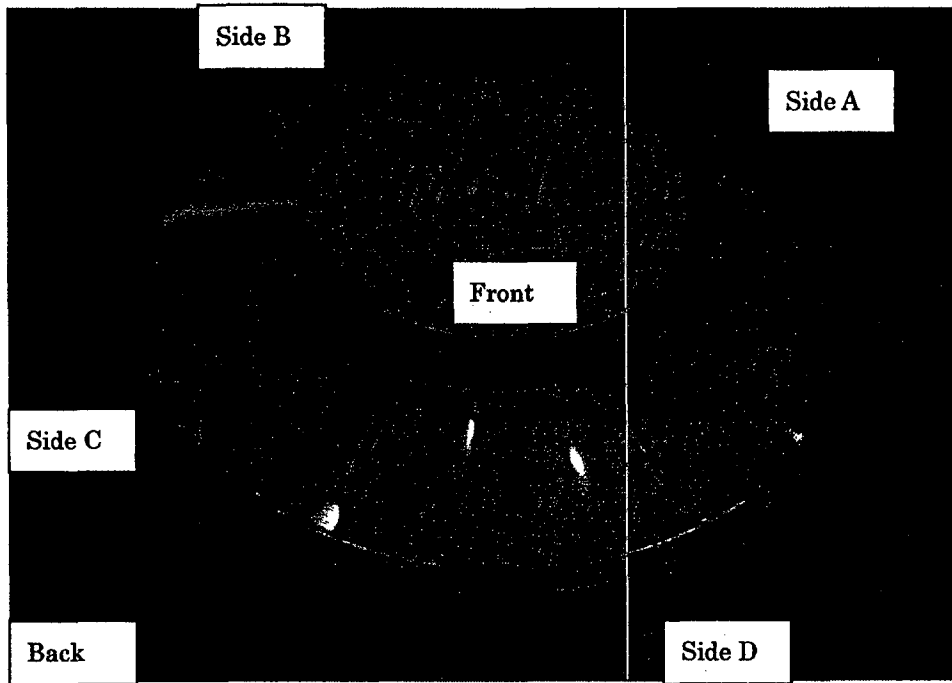


Fig.1 Points of Dose Rate Measurements

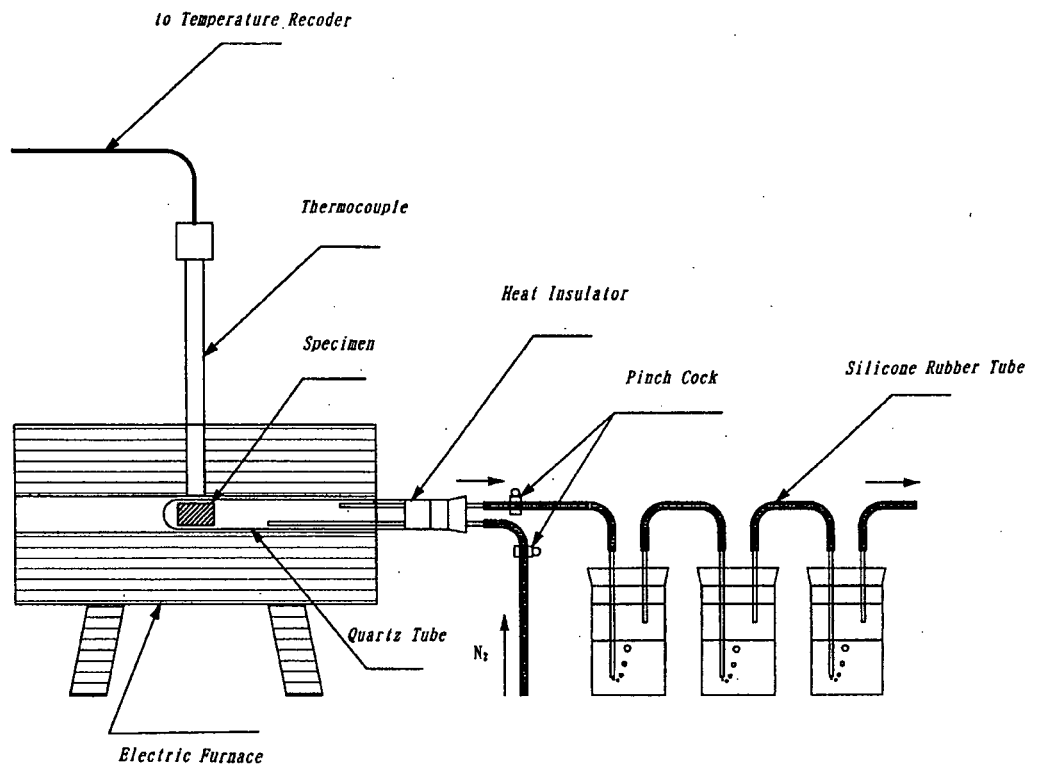


Fig.2 Schematic Diagram of the Heat Testing Apparatus

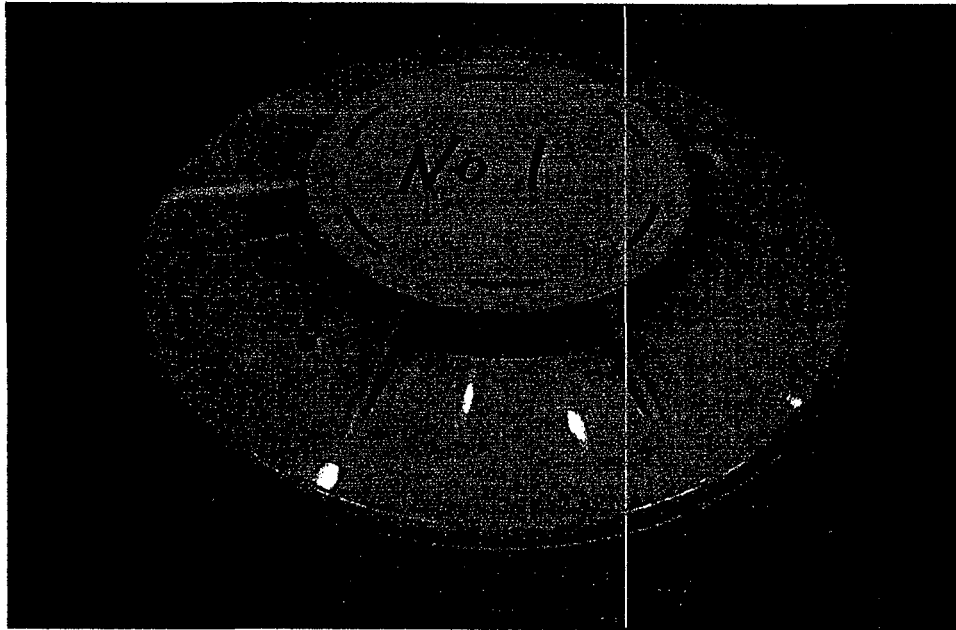


Fig.3 Appearance of the Specimen before the Drop Test (No.1)

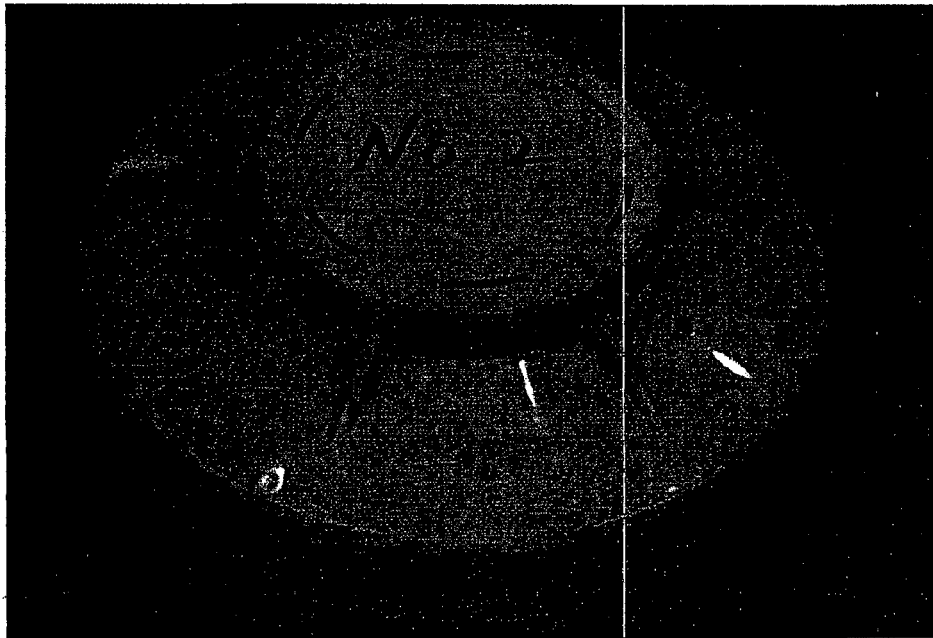


Fig.4 Appearance of the Specimen before the Drop Test (No.2)

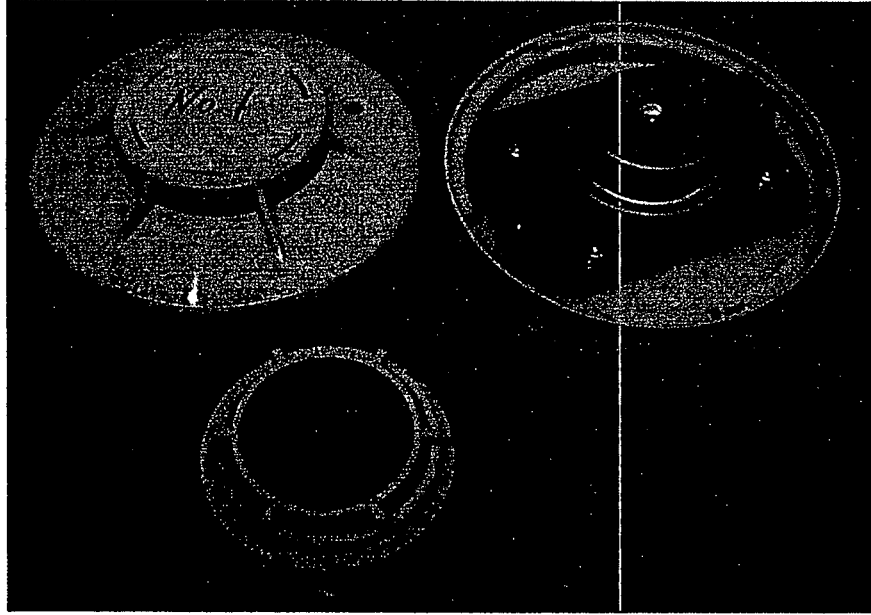


Fig.5 Appearance of the Specimen after the Drop Test (No.1)

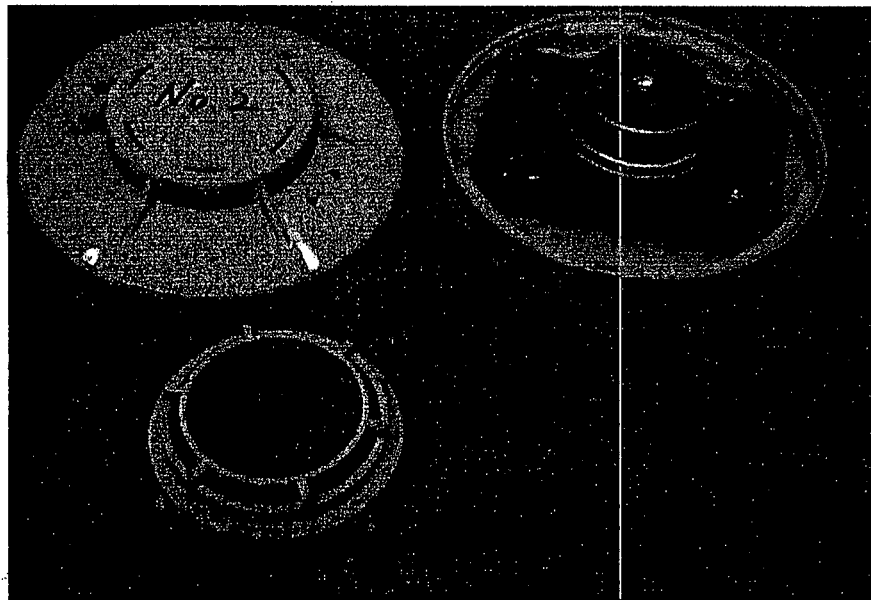


Fig.6 Appearance of the Specimen after the Drop Test (No.2)

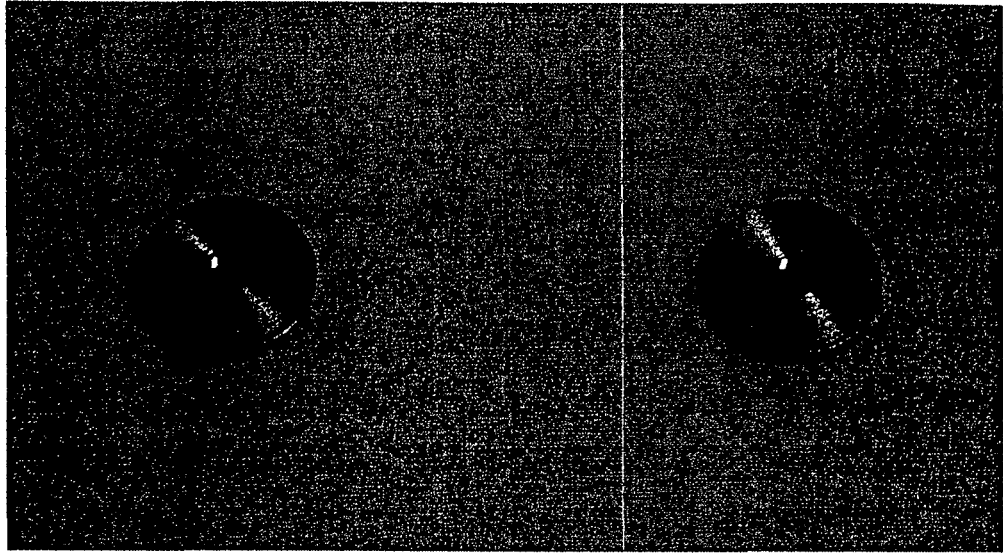


Fig.7 Appearance of the Specimen before the Heat Test (No.1,No.2)

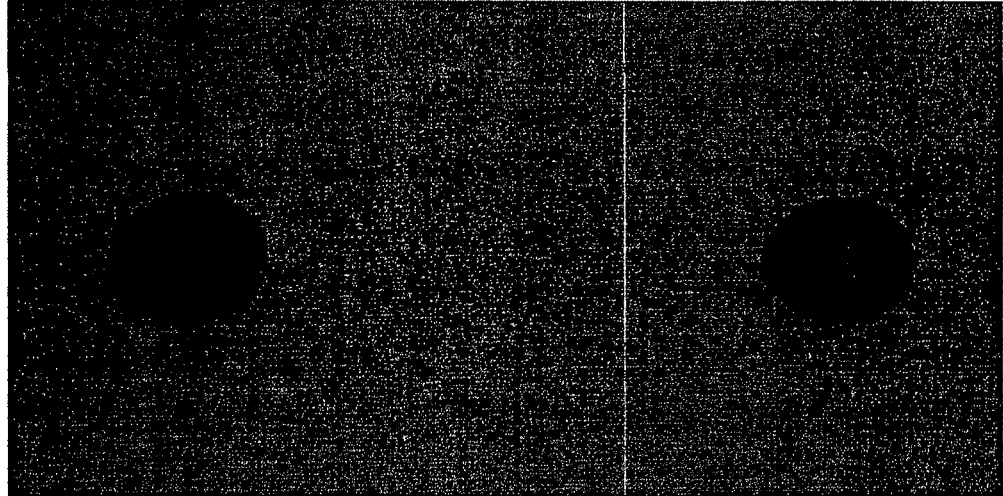


Fig.8 Appearance of the Specimen after the Heat Test (NO.1,No.2)