

Necessity of World Wide Regulation for Radioactive Consumer Products in Current Markets

Ochanomizu University, Japan

Etsuko FURUTA

Radioactive Consumer Products; RCP

Radioactive materials have been used in many situations soon after the first discovery.



Residential smoke detector
Am-241; 37kBq



Gas lantern mantle
Th-232; 1.4kBq



Fluorescence paint of a
clockface Ra; 3.7kBq

Radiation exposure became clear.

- ⊙ Ra⇒IXRCP (ICRP)
- ⊙ Issue of NORM
- ⊙ The thinking ways of ICRP, IAEA, WHO, OECD/NEA

Unjustified exposure;
Food, Drinking water,
Cosmetics, Toys,
Personal Jewelry (feed)



- ⊙ Japanese NORM guideline; the external exposure less than 1mSv/y for normal use has no problem.

Purpose

Investigation into the actual circumstances of radioactive consumer products in current markets

by analyzing radioactive concentration
by estimating exposure doses from the normal use

To clarify the issue of RCP

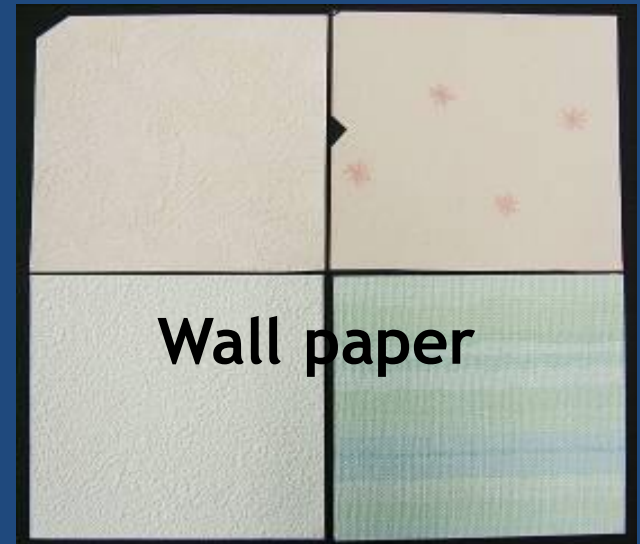
Ex. RCP sold in a current market



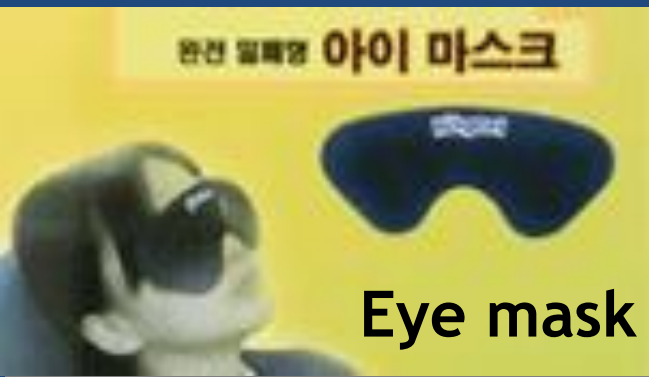
Cosmetics



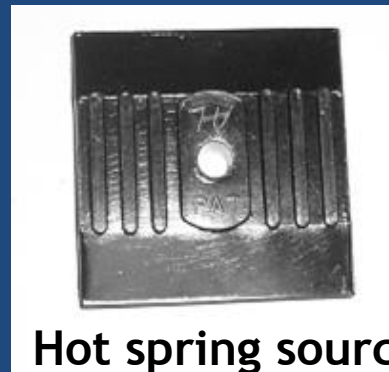
Personal jewelry



Wall paper



Eye mask



Hot spring source



Pillow and stuffing



Neutron activated Gems :

Morganite



Kitawaki et al: Gems & Gemology, Spring, 2-4(2012)

No	RCP Name	Concentration (Bq g ⁻¹)* ¹	
		²³² Th	²³⁸ U
1	Jell-1	(4.1±0.3)×10 ¹	(1.5±0.01)×10 ¹
2	Liquid (red)	(2.1±0.01)×10 ¹	(3.9±0.3)×10 ⁰
3	Cream	(2.0±0.07)×10 ¹	(7.1±0.2)×10 ⁰
4	Face powder	(6.8±0.01)×10 ¹	(1.3±0.01)×10 ¹
5	Jell-2	(4.1±0.3)×10 ¹	(1.5±0.01)×10 ¹
6	Body lotion	(1.8±0.2)×10 ⁻³	-
7	Mascara	(1.1±0.1)×10 ⁻¹	(5.6±1.2)×10 ⁻¹
8	<u>Bedrock-bath; red</u>	(1.3±0.07)×10 ³	<u>(1.9±0.04)×10²</u>
9	<u>Bedrock-bath; white</u>	(1.3±0.02)×10 ³	<u>(2.1±0.1)×10²</u>
10	<u>Bakelite</u>	(5.4±0.04)×10 ³	(8.6±0.3)×10 ¹
11	Ra powder	(2.6±0.1)×10 ⁻¹	(2.1±0.2)×10 ⁻¹
12	Ra rock	ND	(6.3±0.09)×10 ¹
13	Gas lantern mantle	(1.7±0.1)×10 ²	(4.2±0.1)×10 ⁰
14		(2.9±0.1)×10 ²	(5.8±0.1)×10 ⁰
15	Mileage	(1.6±0.1)×10 ⁰	(3.7±0.5)×10 ⁰
16	improvement	(4.1±0.04)×10 ²	(7.3±0.2)×10 ¹
17	<u>Deodorant</u>	(1.6±0.1)×10 ³	<u>(3.0±0.05)×10²</u>
18		(1.6±0.07)×10 ²	<u>(2.3±0.07)×10²</u>
19	Pillow	(1.2±0.05)×10 ²	(1.8±0.4)×10 ¹
20	Wall paper	(4.4±0.01)×10 ⁰	(9.9±1.2)×10 ⁻¹
21	Optical microscope	(2.7±0.1)×10 ²	ND
22	Under wear	(1.1±0.01)×10 ⁰	(1.3±0.01)×10 ⁰
23	T-shirt	(1.4±0.1)×10 ⁻²	(1.6±0.01)×10 ⁻²
24	Wide stomach band	(2.1±0.1)×10 ⁻²	(9.5±0.01)×10 ⁻³
25	Monaz-bracelet	(8.2±0.1)×10 ²	(1.3±0.2)×10 ²
26	Sports bracelet	<u>(5.0±0.6)×10²</u>	<u>(1.0±0.02)×10²</u>
27	Eye-mask (Japan)	(2.3±0.2)×10 ¹	(9.8±0.3)×10 ¹
28	Eye-mask (Korea)	(4.2±0.3)×10 ¹	(6.8±0.9)×10 ⁰

Radioactive concentration by HPGe

Main other elements:
Ce, Zr, Sm, Gd, Yb,
Eu, Hf, Ca, Mg, Fe
(analyzed by INAA and
ICP-MS)

RCP No	External exposure ($\mu\text{Sv h}^{-1}$)	Annual dose (mSv per 2000h)	Internal exposure & Rn activity
Jell-1	3×10^1	Skin* ¹ ; 2	Born; $6 \times 10^1 \mu\text{Sv y}^{-1}$
Liquid(red)	3×10^{-1}	Skin* ¹ ; 2×10^{-2}	Born; $2 \times 10^1 \mu\text{Sv y}^{-1}$
Cream	9	Skin* ¹ ; 3	Liver; $3 \times 10^1 \mu\text{Sv y}^{-1}$
Face powder	2×10^1	Skin* ¹ ; 5×10^{-1}	Lung; 6 mSv y^{-1}
Jell-2	3×10^1	Skin* ¹ ; 2	Liver; $2 \mu\text{Sv y}^{-1}$
Ra-rock	2×10^{-1}	4×10^{-1}	$7 \times 10^2 \mu\text{Sv y}^{-1}$
Gas lantern mantle	8 1	2×10^1 2	Progeny released by combustion
Mileage improvement	2×10^{-3} 3×10^{-3}	5×10^{-3} 6×10^{-3}	N.P.
Deodorant	6×10^{-3} 8×10^{-6}	1×10^{-2} Skin* ¹ ; 4	N.P.
Pillow	3×10^{-1}	5×10^{-1}	6 mSv y^{-1} at 25 m^3
Wall paper	1×10^{-2}	2×10^{-2}	$2 \times 10^1 \mu\text{Sv y}^{-1}$
Optical scope	9	2×10^1	N.P.
Bracelet	1×10^2	2×10^2	N.P.
	2×10^2	3×10^2	N.P.
Eye-mask	2×10^2	4×10^2	N.P.
	5×10^1	1×10^1	N.P.

Estimation of Radiation Exposure at normal use

External exposure;
< 1 mSv/y
Internal exposure;
Not so high

What are issues about RCP?

1. Do you know the real influence of low level radiation exposure ?
2. Is the RCP the only source to exposure for us ?
3. Do they prove their healthy effect like the hormesis effect by themselves ?
4. When a user uses these RCP with too long time or more than one consumer product at one time, is it safe ?

We do not know real answers for these questions.
However, I know that the second and the third answers are NO.

Summary

- ◎ Many kinds of RCP are sold in current markets in Asian area, particularly in Japan.
- ◎ In many cases, the annual radiation exposure doses with the RCP by normal use are less than 1mSv/y.
- ◎ However, the RCP with high radioactive concentration were found in a few cases.
- ◎ The effect of consumer products should prove itself in product.

No justification to add radioactive materials for 6 items:
Food, Drinking water, Cosmetics, Toys, Personal Jewelry, Feed

Conclusion

World wide regulation for radioactive consumer products is necessary.

Thank you for your attention!!

