How Can We Eliminate Radiation from Radioactive Materials?

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Content

I  Introduction
   * Scenario (Ideas) for elimination of radioactivity

II  Experiments and Theory
   * short & more than 6 months follow-up
     and theoretical approaches

III Results and Discussions

IV Summaries
INTRODUCTION

Polices from each prefecture in Japan guard to go into the “hot spot” May......
INTRODUCTION

Namie machi in May 5th, 2011

23 km from Fukushima 1st nuclear plant

Max. 420 μSv/h in this day

Sugihara
INTRODUCTION

General methods for reduction (?) of radioactivity

1. Only wash by water → contaminated matter?

2. Adsorption by zeolites → Efficiency of absorption?
   - Size of ion (pm);
     Cs $1.65 > K 1.33 > Na 0.98$
   - Oxidation-reduction potential (volts)
     Na; -2.7 > Cs; -2.9 > K; -2.9

As the results, Cs must compete with Na and K

3. Reaction with bacteria & plants
   → Practical use?
what is elimination of radioactivity?

---- genuine method / be true to Nature ---

- **Shield**: “coolant“ water just like in the reactor

- how to shield ray and electron beam

- change Cs to non-radioactive matter

Various kinds of elements have been formed as stable ones since the earth was born.
周期率表の一部

周期率表（原子番号、原子量）

- U, Pu, Te, Xe

Emitted elements: 32 from Fuku.1st
Elements including a various short half life
INTRODUCTION

Chemical aspects

Hydronium pasteurizing,
Elimination of active oxygen.

Physics

Dissociation of hydrogen bond and movement of electron are important

**Computer simulation of water molecule (DV-Xα)**

Even after braking hydrogen bonds, molecules are still stable.

Bond Overlap Population in Ground State

Bond Overlap Population in Excited State

Distance vs energy

“Infoton” \( \rightarrow \) itinerant \( <\text{H}^+\text{-e}^-> \)

\( \text{No. of excited electron} \ 0.5 \sim 1 \ \text{vs energy} \)

Sugihara, Water J. 2009
NMR, and water molecule can be smaller

Relaxation time & Half-width of spectral...

1....

Value of:

Active water 0.035
City water 0.016

Image of water molecule

Distance between collisions

Measurement: Prof. Takayama 2010
What is the Infoton?

Dissociated hydrogen bonds generate the Infoton(s)

\[ \text{Infoton } H^+--e^- \]

Symbol mark; \(<H_2O| = |h.>\)

\[ \text{bra & ket vector} \]


Similar to EZ water?

🌟 a plasma-like state (looks like in a metal surface = plasmon)

🌞 Emit radiation of “Far Infrared” to THz \((10^{13} \sim 10^{12} \text{ Hz})\)

→ Long wave length

🌟 Extended particle like an elementary particle, and described in wave function
INTRODUCTION

Wave function of Infoton.

\[ i \hbar \frac{\partial}{\partial t} \psi(r, t) = H \psi(r, t) \]

\[ H = \int \psi^* \left[ \omega \left( i \hbar \mathbf{c} \nabla + e \mathbf{A} \right) \psi - mc^2 \beta \psi \right] d\tau \]

\[ + \int \left[ 2 \pi c^2 P_1^2 + \frac{1}{8\pi} (\text{curl } \mathbf{A})^2 \right] d\tau + \frac{1}{2} \int \int \frac{\rho(r, t) \rho(r', t')}{|r - r'|} d\tau d\tau' \]

\( P \); momentum, \( A \); electromagnetic potential, \( e \); electrical charge
\( r - r' \); the distance between the nucleus and the Infoton \( < H^+e^- >_{p/e} \).
INTRODUCTION

Macroscopic aspects for shielding

low frequency  high frequency

- longer wavelength  shorter wavelength

such as Infoton
- ex. Far Infrared and/or THz radiation

-ray ( photon ) is absorbed by Infoton $\text{H}^+ - \text{e}^-$ (left hand side)

Shielding $\text{resonance}$ like resonance circuit in the devices
(Transition of energy is accompanied with an absorption of one quantum)
Is it possible the reaction between $Cs$ and Infoton $< H^+-e^- >$.

Hyperboloid and Gauss curvature

$$K(p) = \lim_{r \to 0} \frac{3}{\pi} \left( \frac{2\pi r - L_p(r)}{r^3} \right)$$

$L_p(r)$; circumference of geodesic line
$r$; distance between Cs & infoton

$10^{-15}$ m

Larger curvature

Momentum of Infoton becomes larger

Hyperboloid potential

<table>
<thead>
<tr>
<th>Cs 137</th>
<th>energy 662keV</th>
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<tr>
<td>Cs 134</td>
<td>563~1365 keV</td>
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Ge-detector @ Kobe Univ.
How can Cs interact with Infoton?

Cs137

infoton

Pommel shape potential

Ba 138 etc.
Synthesis of elements from Cs-137

----- application of group theory ------

A + 1 = 138  ------ Ba
Z + 1 =  56

A+  2 = 139  ------ La
Z +  2 =  57

A + 3 = 140  ------ Ce
Z +  3 =  58

3 <H+e> . 2 <H+e> + 1 <H+e>

4 <H+e> . 2 <H+e> + 2 <H+e>
Another Mathematical Postulation

Local field theory with operator math.

(D, t)_P; proton field in Cs, (D', T)_I; Infoton field model; < Cs >→ H^+--e-> spin is regarded

1) **Overlap** on two operators

2) **Separation** on two operators Simultaneously be formed!

Now requirement are:

Operator \( \phi(X, t) \) occupies field \( D_p \rightarrow \) annihilation operator ; Cs

Operator \( \overline{\phi(X, t)} \) occupies field \( D_I \rightarrow \) creation operator ; Ba
Application of **Multiplication method in Group Theory**

Table 2: Long-wavelength synthesis of elements by reaction of $^{137}\text{Cs}$ with Inflator, $<\text{H}^- - \text{e}^->$, calculated by using group theory. The group consisted of six action elements (I, A, B, C, D, E); for example, $(B \times D) = C$, and C means element of $2 <\text{H}^- - \text{e}^->$ functions only in the valence of the element and does not react with the nucleus. E, $4 <\text{H}^- - \text{e}^->$ means $2 < > + 2 < >$. As a result, we obtain the predicted values: Ba 52%, La 32%, and Ce 16%.

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<tr>
<td>$^{137}\text{Cs}$</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>$&lt;\text{H}^- - \text{e}^-&gt;$</td>
<td>$\text{Ba} + 1, Z + 2$</td>
<td>$\text{I} + 1, Z + 1$</td>
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<tr>
<td>$\text{A} + 3, Z + 3$</td>
<td>$\text{D} + 3, Z + 3$</td>
<td>$\text{C} + 2, Z + 2$</td>
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<tr>
<td>$\text{Ba}$</td>
<td>$\text{Ba}$</td>
<td>$\text{Ba}$</td>
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<tr>
<td>$\text{La}$</td>
<td>$\text{La}$</td>
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$<\text{H}^- - \text{e}^->$

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<td>$\text{B} + 2, Z + 2$</td>
<td>$\text{C} + 3, Z + 3$</td>
</tr>
<tr>
<td>$\text{E} + 0, Z + 1$</td>
<td>$\text{D} + 0, Z + 1$</td>
<td>$\text{F} + 1, Z + 1$</td>
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<tr>
<td>$\text{La}$</td>
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<td>$\text{Ce}$</td>
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</tr>
<tr>
<td>$\text{C} + 2, Z + 2$</td>
<td>$\text{A} + 1, Z + 1$</td>
<td>$\text{F} + 1, Z + 1$</td>
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<tr>
<td>$\text{La}$</td>
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$<\text{H}^- - \text{e}^->$

Ba 52%, La 32%, Ce 16%
Exp. 1  Radioactivity changed

Place: 23km from Fukushima N.P. site

The soil was placed in activated pot (1.9 L).

After an hour  After 7 hours
Exp. 2  Radioactivity changed

Residual radioactivity up to one month

From half life

One month

Time/log

0 20 40 60 80 100
0 1 2 3 4 5 6 7 8

Residual (%)
Follow-up of radiation reduction for 3 months.

Exp. 3 Radioactivity changed

Soils at 23km from Fukushima N.P.P.
Exp. 4  Radioactivity changed

μ Sv/h

6 months
Exp. 5 Radioactivity changed

Reduction rate (%)

Measurement: high purity Ge detector@ Kobe Univ.

<table>
<thead>
<tr>
<th>Sample</th>
<th>$^{134}$ Cs Bq/g</th>
<th>$^{137}$ Cs Bq/g</th>
<th>$^{40}$ K Bq/g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(sample/control ratio)</td>
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<td>(sample/control ratio)</td>
</tr>
<tr>
<td>Dry C</td>
<td>520</td>
<td>544</td>
<td>2.34</td>
</tr>
<tr>
<td>Wet C</td>
<td>258 (0.504)</td>
<td>272 (0.50)</td>
<td>----</td>
</tr>
<tr>
<td>GP5-F</td>
<td>111 (0.786)</td>
<td>116 (0.787)</td>
<td>1.35 (0.577)</td>
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Dry C 20g Control soil. 0.061 mR/h 0.57 μSv/h
Wet C 20g placed in the activated pot with 50 cc water, measured after 6 months.
GP5-F 20g measured at 7 days after Wet C
Radiation of elimination due to Synthesis of new elements

Analysis by ICP MS method

For the control, city water was mixed with the soil. The levels of Ba, La, and Ce detected after the treatment were markedly different from those usually present in soil.

Soil + water filtered, then solutions are analyzed.
Results of another experimental methods

Experimental results close to theoretical, although they have some discrepancy.
Summary

🌟 We found new idea and experimental results for elimination of radioactivity.

➡️ Theoretical approaches was proposed;

1) To utilize quantum effect of “Infoton” from treated water.

2) To apply Group theory for reaction between Cs nuclei and “Infoton”.

➡️ Confirmed by experimental way

1) Reduction of radioactivity of soils from the nuclear power plant.

2) Stable elements; Ba, La and Ce were confirmed in analysis
Acknowledgements;

Mr. K.Hatanaka for “Water treatment” to get activated devices,

And also Mr. S. Katanahara for 100 L transportable-facility to get activated water and instrument of radioactivity (GM counter ,“Inspector” )

Measurement of radioactivity (identification and energy; HPGe ); Professor A. Kitamura @ Kobe University

Mr. K. Hagiwara @ Kanagawa University for measurement of ICP mass , and Mrs. M.Shishido @ ACR Co. for ICP AES.

Measurement and sampling of contaminated soil etc.; Mr. Y.Nagasaka @ Brighton Inc.

Mr. M. Emoto for Instrument of radioactivity (GM counter, “- Scout”) and for financial support.
Thank you for your attention