

# Contribution of Chemistry to the future of Fukushima and Japan

Yasuhiro Iwasawa

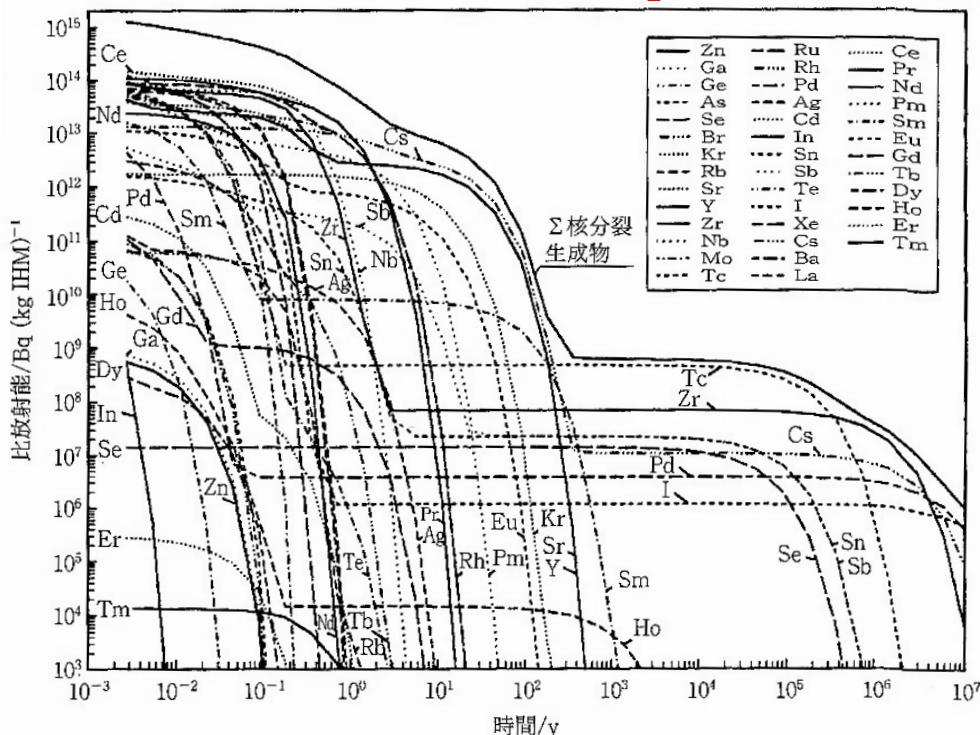
President of The Chemical Society of Japan  
The University of Electro-Communications

SCJ Symposium, Nov. 26, 2011

## **Activity of The Chemical Society of Japan after Fukushima Nuclear Accident**

- 3/17      ▪ Condolence by the President for the East Japan disaster and Fukushima nuclear accident
- 4 /27     ▪ Statement by 34 societies for science and young scientists
- 5 /30     ▪ Donation of science books to libraries in the disaster areas
- 6/22      ▪ Meeting with MEXT for removal of radioactive materials
- 8/26      ▪ Symposium and panel discussion on vision of new Tohoku
- 11/13-15 ▪ Meeting of the Society for energy and chemistry  
and many others

# Radioactive species in used nuclear fuels



10年 > : Xe, Zr, Mo, Nd, Cs, Ru  
 10 - 10<sup>3</sup> 年: <sup>90</sup>Sr, <sup>90</sup>Y, <sup>137</sup>Cs, <sup>137m</sup>Ba, <sup>151</sup>Sm  
 少量: Sb, Ce, Eu, Pm, Ru, Rh, Krの同位体  
 10<sup>3</sup> 年 < : <sup>99</sup>Tc, Pu, その他のアクチノイド

## Toxicity of radioactive elements

- I. 非常に強い: <sup>90</sup>Sr, Ra, Pa, Pu
- II. 強い: <sup>45</sup>Ca, <sup>55</sup>Fe, <sup>91</sup>Y, <sup>144</sup>Ce, <sup>147</sup>Pm, <sup>210</sup>Bi, Po
- III. 中程度: <sup>3</sup>H, <sup>14</sup>C, <sup>22</sup>Na, <sup>32</sup>P, <sup>35</sup>S, <sup>36</sup>Cl, <sup>54</sup>Mn, <sup>59</sup>Fe, <sup>60</sup>Co, <sup>89</sup>Sr, <sup>95</sup>Nb, <sup>103</sup>Ru, <sup>106</sup>Ru, <sup>127</sup>Te, <sup>129</sup>Te, <sup>137</sup>Cs, <sup>140</sup>Ba, <sup>140</sup>La, <sup>141</sup>Ce, <sup>143</sup>Pr, <sup>147</sup>Nd, <sup>198</sup>Au, <sup>199</sup>Au, <sup>203</sup>Hg, <sup>205</sup>Hg
- IV. 弱い: <sup>24</sup>Na, <sup>42</sup>K, <sup>64</sup>Cu, <sup>52</sup>Mn, <sup>76</sup>As, <sup>77</sup>As, <sup>85</sup>Kr, <sup>197</sup>Hg

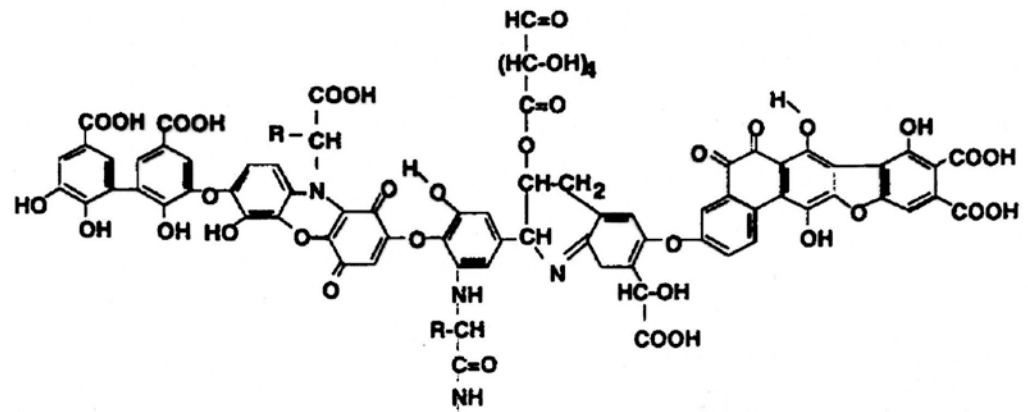
## Half life of radioactivity

核種	主な放射線	集積部位	物理的半減期	実効半減期
<sup>3</sup> H	β	体組織	12.35 y	12 d
<sup>90</sup> Sr	β	骨	29.1 y	6000 d
<sup>99</sup> Tc	β	大腸下部	2.1 × 10 <sup>5</sup> y	0.75 d
<sup>131</sup> I	β, γ	甲状腺	8.04 d	7.6 d
<sup>137</sup> Cs	β, γ	全身	30.0 y	70 d
<sup>226</sup> Ra	α, γ	骨	1600 y	16000 d
<sup>238</sup> U	α, γ	肺, 腎臓	4.5 × 10 <sup>9</sup> y	15 d
<sup>239</sup> Pu	α, γ	骨	24065 y	72000 d

# ***Distribution and state of Raioactive species***

- $^{137}\text{Cs}+^{134}\text{Cs}$
  - $^{90}\text{Sr}$
  - $^{99}\text{Tc}$
  - Actinoid
- Chemical states and spatial distribution
- Oxidation states
- U IV•VI
  - Pu III•IV•V•VI

- Approaches by chemical experiments
- Characterization of soils



Proposed structure of humic acid (by Draunov).

# **Contribution of chemistry**

- \* Chemical analysis for distribution of radioactive species**
- \* Judgment of rational methods for removal of radioactive species**
- \* Establishment of chemical techniques in short and long terms**
- \* Proposal of new chemical technology for regeneration of Fukushima**
- \* others**