C10.* Analysis of Experimental Data Sets on Pd Complexes by Iwamura et al. [Kozima 2011b, 2016a]

The interesting experimental data sets obtained by Iwamura et al. [Iwamura 1998, 2005, 2006a, 2006b, 2006c] give us information about the local nature of the nuclear transmutation and also a phase of neutron-nucleus interactions in the CFP, the absorption of a neutron-proton cluster by a nucleus.

They used a specific structure called "Pd complex" shown in Fig. C10-1.

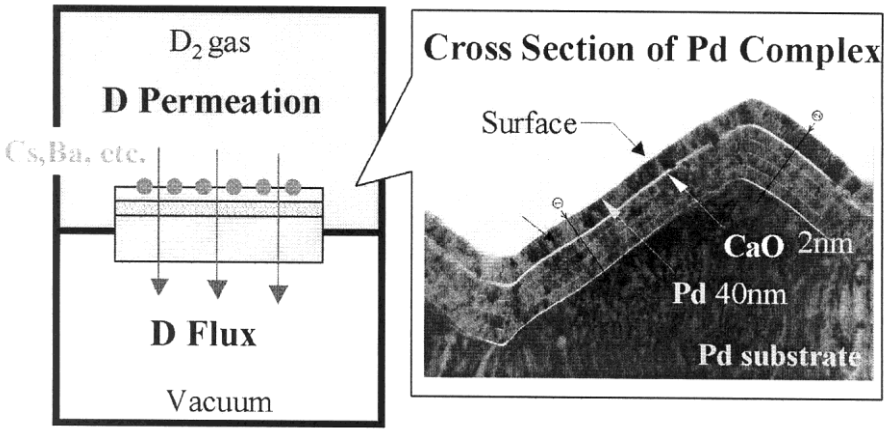

Fig. C10-1 Pd complex used in the experiments by Iwamura et al. [Iwamura 2006c]

The Pd complex is composed of a Pd thin film, alternating CaO and Pd layers and bulk Pd as shown in Fig. C1-1. This composition was determined based on the condition which seems to be one of necessary conditions which give rise to the CFP that existence of a low work function material, typically CaO, near the Pd surface [Iwamura 2005].

After adding alien elements Cs, Sr or Ba on the surface, D_2 gas was permeated through this structure as shown in Fig. C10-1, they investigated the surface of the complex and found nuclear transmutations of elements Cs to Pr, Sr to Mo and ${}^{A}_{56}Ba$ to ${}^{A+12}_{62}Sm$. This results have clearly demonstrated the nuclear reactions catalyzed by neutron-proton clusters ${}^{8}_{4}\delta$ and ${}^{12}_{6}\delta$ that were already assumed before to explain nuclear transmutations (NTs) observed in deuterium and protium systems [Morrey 1990, Kozima 1998a];

- ${}^{A'}_{4}\delta + {}^{A}_{38}Sr = {}^{A+A'}_{42}Mo,$
  (A = 84, 86-88; A+A' = 92, 94 – 98, 100; A' = 4 – 16) (C10.1)

${}^{8}_{4}\delta + {}^{133}_{55}Cs = {}^{141}_{59}Pr,$ (C10.2)

${}^{A'}_{6}\delta + {}^{A}_{56}Ba = {}^{A+A'}_{62}Sm,$
(*A* = 132, 134 –138, A+ A' = 144, 147 – 150, 152, 154; A' = 6 – 22) (C10.3)

In the case of the third reaction (C10.3), they confirmed the transmutation from $^{137}_{56}$Ba and $^{138}_{56}$Ba to $^{149}_{62}$Sm and $^{150}_{62}$Sm, respectively. These cases are explained by the reaction associated with the neutron drop $^{12}_{6}\delta$.

In addition to the data of nuclear transmutations catalyzed by the $^{A}_{Z}\delta$, they determined the locality of the positions where occur these NTs to generate Pr, Mo and Sm by using 100- and 500-micron x-ray beams (Fig. C10-2).

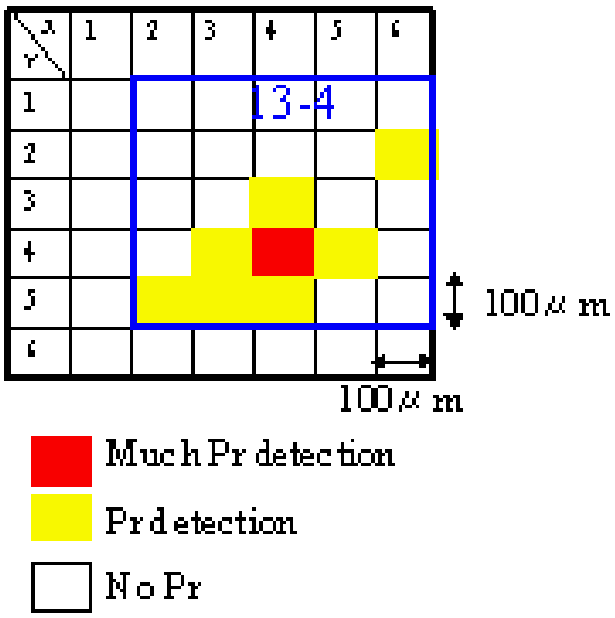

Fig. C10-2 Surface distribution of Pr for FG2 using 500-micron and 100-micron x-ray beams, mapping of Pr by 100-micron beam [Iwamura 2006c].

The localization of the nuclear transmutation confirmed in this experiment reminds us the localization of tritium observed by Iyengar et al. [Iyengar 1989]. These localizations of nuclear products may be explained by the positive feedback mechanism described in our paper on the complexity [Kozima 2008c] occurring in this case in localized regions.

In conclusion, their extensive data sets determined the localization of nuclear reactions resulting in the NTs at hot spots with a diameter up to 10 to 50 nm (100 to 500 A) in the surface layer of thickness up to 10 nm (100 A).