The Launch of a New Plan on Condensed Matter Nuclear Science at Tohoku University

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1.Background

Tohoku University

Prof. Kasagi

; Fundamental Research on CMNR (Screening etc..) Mitsubishi Heavy Industries, Itd.

Iwamura, Itoh, Tsugura

; Deuterium Permeation Transmutation Experiments

Clean Planet Inc.

Yoshino, Hattori, Igari

; Excess Heat Experiments with Dr. Mizuno

1-1 Tohoku University (1) Low-energy deuteron generator at Tohoku Univ.



E_d = 2 ~ 100 keV
25 ~ 100 keV; acceleration mode
2 ~ 25 keV ; deceleration mode

I_d up to 500 μA



1-1 Tohoku University (2) Anomalously enhanced DD reaction in metal



Reaction rates at 2.5 keV $R(\text{in PdO}) \sim 100 \times R(\text{standard})$ $R(\text{in Pd,Fe}) \sim 10 \times R(\text{standard})$ $R(\text{in Ti, Au}) \sim 2R(\text{standard})$

R(standard): thick target yield

Large screening potential energy Partly due to electrons, but not understood clearly; need other origin

Yuki et al., JETP Lett. 68 (1998) 823; Kasagi et al., J. Phys. Soc. Jpn. 71(2002) 2881

1-2 Mitsubishi Heavy Industries (1) Deuterium Permeation Transmutation Experiments



Y. Iwamura, M.Sakano and T.Itoh, "Elemental Analysis of Pd Complexes: Effects of D2 Gas Permeation", Japanese Journal of Applied Physics, Vol.41, p.4642-4650, 2002.

1-2 Mitsubishi Heavy Industries (2) Summary of Transmutation Reactions observed so far



Y. Iwamura, T. Itoh and S.Tsuruga, Current Science, Vol. 108, NO. 4, p.628-632, 2015.

1-2 Mitsubishi Heavy Industries(3) Independent Reproduction Experiments by Toyota Central R&D Labs.



1-3 Clean Planet Inc.(1) Experimental Set-up





Presented at 2014 CF/LANR Colloquium at MIT, March.21-23, 2014, Massachusetts Institute of Technology, Cambridge, MA, USA

1-3 Clean Planet Inc.(2) Excess Heat Generation



Presented at 2014 CF/LANR Colloquium at MIT, March.21-23, 2014, Massachusetts Institute of Technology, Cambridge, MA, USA

2. Condensed Matter Nuclear Reaction Division (April 2015 ~)

It belongs to Research Center for Electron Photon Science, Tohoku University, Sendai, Japan



Research Center for Electron Photon Science



2-1 Purpose of the Division

- I. Fundamental Research on Condensed Matter Nuclear Reaction (CMNR)
 - Systematic Data on CMNR
 - Improve the reliability of Measurement of CMNR
- 2. Development of a New Energy Generation Method
 - Most Probable Method for Energy Generation
 - Ascertain the Feasibility as a new energy source
- 3. Development of a New Nuclear Waste Decontamination Method
 - Enhance the rate of Transmutation
 - Supported by the ImPACT R&D Program

2-2 Organization of the Division

Clean Planet Inc.

Develop and Promote Clean Energy Technologies

Hideki Yoshino, Takehiko Itoh Masanao Hattori

HEAD

Tadahiko Mizuno

Research Center for Electron Photon Science, Tohoku University

Condensed Matter Nuclear Reaction Division (2015-2018)

Jirohta Kasagi Yasuhiro Iwamura Hidetoshi Kikunaga Takehiko Itoh Hideki Yoshino Nuclear Physics, Beam Physics/Accelerator Science, Radio-chemistry

> Condensed Matter Nuclear Science Group Jirohta Kasagi

Radio-chemistry Group Hidetoshi Kikunaga

Jointly Participation

Mitsubishi Heavy Industries, Itd. ImPACT Project (2015-2018) Reduction and Resource Recycle of High Level Radioactive Wastes with Nuclear Transmutation

2-3 Outline of Research Plan

	FY 2015	FY 2016	FY2017	FY2018
Excess Heat Generation	Seeking for the M Method for Energ	ost Probable y Generation	Ascertainment t as a new energ	he Feasibility y source
Nuclear Transmutation	Transmutation of Stable Elements, NAA of Products	Transmutation of for Nuclear Was	of Radioactive Isot ste Decontaminat	topes ion

3. Concluding Remarks

- This is the first official research division created for condensed matter nuclear reaction (CMNR) and its application in Japan.
- At this division, we will obtain fundamental data on nuclear reaction in anomalous heat generation phenomena, as well as in nuclear transmutation phenomena.
- We hope to bring revolutionary changes to the World through the conceptual change of conventional nuclear reaction.

Backup Slides

ImPACT R&D Program

Reduction and Resource Recycle of High Level Radioactive Wastes with Nuclear Transmutation



PM: Reiko Fujita

To obtain nuclear reaction data for long-lived fission products, and to confirm the world's first nuclear reaction path for conversion to short lived nuclides or stable nuclides

- Project 1: Development of separation and recovery technologies
- Project 2: Obtained nuclear reaction data & new nuclear reaction control method
- Project 3: Reaction theory modeling and simulation
- Project 4: Evaluation of nuclear transmutation system and development of elemental technologies
- Project 5: Process concept for design

A Part of this project

Members of the Division

- Research Center for Electron Photon Science, Tohoku University, Japan
 - Jirohta Kasagi
 - Yasuhiro Iwamura
 - Hidetoshi Kikunaga
- Clean Planet Inc., Japan
 - Hideki Yoshino
 - Takehiko Itoh
 - Masanao Hattori
- HEAD, Japan
 - Tadahiko Mizuno