

Advances of QHE R&D at Tohoku University (MIKAMINE Base, Clean Planet Inc.)

Dates	Joint Research Department, Phase I				Joint Research Department, Phase II				Comments
	2015/04 - 2016/03	2016/04 - 2017/03	2017/04 - 2018/03	2018/04 - 2019/03	2019/04 - 2020/03	2020/04 - 2021/03	2021/04 - 2022/03	2022/04 - 2023/03	
Research Stages	No doubt about nuclear transmutation, but not sure about heat generation.	Confirmation of heat generation with hydrogen ⇒ Practical applications possible?	Search for materials producing heat with high reproducibility. For practical use, need to enlarge the material for increased heat.	Radiation thermometers improve the accuracy of much-criticized thermal measurements; more convincing for academia.	Devising and demonstrating new methods for large heat generation including the permeation model. Start of verification experiment with optical spectra.	Confirmation of exothermic energy when inert gases such as He and Ar are used.	PTM clarifies that current thermal measurement methods do not have significant errors.	Optical spectrum measurement results confirm that the same level of heat generation is occurring, further improving reliability of heat measurement.	
Main Research Topics	- NEDO project started in Oct. 2015. - Mizuno Method reproduction experiment started (for CP patent).	- Heat generation confirmed by NEDO project. - Successful reproduction of Mizuno experiment. - Thin-film heating method (now QHE Method) invented and its equipment developed. - Mitsubishi transmutation experiment started.	- NEDO project ended in Oct. 2017 ⇒ Heat technology acquired and heat generation with hydrogen confirmed. - Current QHE method experiment started combining Mitsubishi and NEDO. - Permeation model developed.	- Unit #1/#2 and radiation thermometers introduced ⇒ heat measurement accuracy improved. - 100W model developed. - KAZAMA model (experiments on extraction of excess heat energy by He gas) developed.	- Permeation model developed. - Optical spectrum experiments started ⇒ improved understanding of heat generating mechanism and more accurate thermal measurement. - Introduction of magnetron sputtering equipment - Mitsubishi transmutation experiments completed	- Permeation model achieved 10 times higher heat generation per area. - PTM phenomenon discovered in June 2020. - KAZAMA experiment started and confirmed that generated heat (up to 200W) can be extracted with He.	- AES model developed ⇒ contamination of the equipment due to heat insulation materials; the importance of no contamination in the equipment reaffirmed. - Charged particle emission ⇒ possibility of direct power generation	- Screening chamber method started (AES device also integrated) ⇒ search of material composition for high heat generation. - Research of correlation between heat generation and oxygen ⇒ reaction products?	
Patents (Only those filed in Japan; first application numbers. Numbers in parentheses are the granted patents.)	JP2015-243890 (JP6066143)	JP2016-193515 (JP6149996) JP2016-189963 (JP6448074)	JP2017-117917 (basic patent) (JP6548102)	JP2018-232054 (KAZAMA) (JP7114108)	JP2019-105514 (JP6696096)	JP2020-064227 (AES) JP2020-513657(Permeation) (JP6749035)	JP2021-009154 JP2022-528184 (Priority) (PTM) (JP7187093)	JP2022-084169 (Potentiometric generation device)	Total Granted in Japan: 8 International: 38
Academic presentation	ICCF19 (Apr. 2015) JCF16 (Dec. 2015)	ICCF20 in Sendai (Oct. 2016; Co-chaired by Kasagi and Iwamura; Sponsored by CP) JCF17 (Mar. 2017)	12th IWAHLM (Jun. 2017; NEDO project presentation)	ICCF21 (Jun. 2018; NEDO project presentation) JCF19 (Nov. 2018) MIT Research Group (Mar. 2019; First presentation of QHE Method)	ICCF22 (Sept. 2019; Presentation of QHE Method) JCF20 (Dec. 2019)	JCF21 (Dec. 2020)	ICCF23 (Jun. 2021) JCF22 (Mar. 2022) Vebleo Webinar on Energy Materials and Technology (Dec. 2021)	ICCF24 (Jul. 2022) IWAHLM15 (Sept. 2022) RNBE2022 (Nov. 2022) JCF24 (Mar. 2023)	Refereed papers: 18 (first-author papers: 9) Published articles: 5 Ranked as Top3% author at Tohoku U.
PR Events	Chubu Atomic Energy Commission	Article in "Electrical Review" Atomic Energy Society of Japan	Article in "Parity" Book of Engine Engineering			Elsevier's book "Cold Fusion" published (Jan. 2021) Talk and Interview at Tohoku University Startup Incubation Center (Yoshino and Iwamura; Jan. 2021) NHK program (Dec. 2020)	Talk at Tohoku University Green Seeds Lounge (Yoshino and Iwamura; Jun. 2021) Vebleo Fellow (Dec. 2021)	Talk at Tokyo Institute of Technology (Jun. 2022) Visit of Minister Kobayashi (Jun. 2022) Talk at Japan Planning Institute (Jun. 2022) Article in "R&D Leader" (Sept. 2022) Talk at Technology Information Center (Dec. 2022)	
Members	Iwamura, Itoh, Kasagi	Iwamura, Itoh, Kasagi	Iwamura, Itoh, Kasagi, Sato	Iwamura, Itoh, Kasagi, Sato, Saito	Iwamura, Itoh, Kasagi, Murakami, Saito	Iwamura, Itoh, Kasagi, Murakami, Saito, Shibasaki	Iwamura, Itoh, Kasagi, Takahashi, Yamauchi, Shibasaki	Iwamura, Itoh, Kasagi, Takahashi, Yamauchi, Shibasaki	
Events at Clean Planet				Capital Alliance with Mitsubishi Estate (Jan. 2019)	Start of Kawasaki Base (Oct. 2020)		Start of Joint Development with Miura (Sept. 2021)	Capital Alliance with Mitsubishi Corporation (Jul. 2022)	