連載

日本での留学経験とその後

Two Decades of Japanese Education and Research Experience

Armando T. QUITAIN

（著者紹介）

今回は熊本大学のキタイン・アルマンド先生に日本での留学経験についてご執筆いただきました。キタイン先生はフィリピンのご出身で，1996年より名古屋大学の後藤繁雄先生に師事し，バイオエタノールと*tert*-ブチルアルコールからのエチル*tert*-ブチルエーテルの反応蒸留に関するご研究に従事されました。現在熊本大学で活躍されており，最近までスペインのValladolid大学に留学されていました。

（第一分科会／保科）

I am Armando T. Quitain from the Faculty of Advanced Science and Technology of Kumamoto University, and I would like to share here my two decades of experience and thoughts about the superior Japanese education and research system, and how this shaped up my career as an educator and researcher in the same system.

(1) Driving Force and Road to a Challenging Japanese Education

I am from the Philippines, and right after I obtained my undergraduate degree in chemical engineering from De La Salle University-Manila in 1992, I was given an offer to teach in the same department while taking up my master studies. This gave me an opportunity to meet my prospective PhD supervisor − Prof. Shigeo Goto of Nagoya University. His excellent work on reaction engineering, catalysis and reactive separation technologies, on top of that, the excellent Japanese education and well-organized research system served as a driving force for me to apply for a Japanese government（Monbusho）scholarship through the recommendation of the Japanese embassy in Manila. Passing the most difficult requirements and qualifications for the scholarship, I was able to join his laboratory and work on reactive distillation as applied to bioenergy production starting in year 1996. The program includes 1 year of intensive Japanese language courses, preparation for the entrance examination and familiarization with the experimental apparatus, prior to entering the regular doctoral program slated for 3 years.

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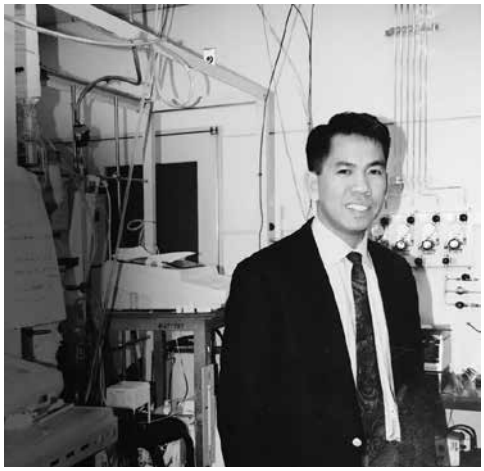

Photo taken in year 2000（with reactive distillation apparatus as background）at the Prof. Shigeo Goto Laboratory, Department of Chemical Engineering, Nagoya University.

(2) Doctoral Thesis on Reactive Separation for Bioenergy Production

My doctoral thesis through the mentorship of Prof. Shigeo Goto focused on the application of reactive distillation for the synthesis of ethyl *tert*-butyl ether（ETBE）from bioethanol and *tert*-butyl alcohol（TBA）. Reactive distillation, a configuration in which the reaction section is located inside the column, is employed to continuously synthesize ETBE from bioethanol and TBA using Amberlyst 15 in pellet form as a catalyst. We got promising results of TBA conversion and selectivity of ETBE of 99.9 and 35.9%, respectively. Further purification of the distillate using the residue resulted in increased purity to 95 mol% ETBE from the original of 60 mol%. The experimental results were compared with those calculated by using an ASPEN PLUS simulator, and the underlying phase equilibrium composition were also investigated. Results were published in journals such as ACS Industrial Engineering and Chemistry Research, Canadian Journal of Chemical Engineering and Journal of Society of Chemical Engineers, Japan.

(3) Superior Japanese Research and Education System

I am really impressed, and has greatly admired the Japanese

research and education system. Other than the excellent and well-organized procurement system for consumables and materials for research, the Japanese educational system is more focused on the development of individuals and their interdependence within the group. Nothing can equal the kind of personal-touch and unselfish mentorship that my PhD supervisor has demonstrated. This training has helped me in a successful pursuit of my own academic and research career also within the same system.

I applied the same effective approach with students and post-doctoral researchers, while working on a JSPS-funded project on the application of supercritical fluids to biomass utilization as a JSPS Researcher under Prof. Koichi Fujie and Prof. Hiroyuki Daimon of Toyohashi University of Technology, right after obtaining my PhD degree in 2000. Although the technology was new to me, with the same approach, the group became productive and had published numerous research articles in high-impact chemical engineering-related journals. I could also noticed the same mentoring style from my great mentors − Prof. Takashi Moriyoshi and Dr. Shunsaku Katoh of the Research Institute for Solvothermal Technology（Kagawa, Japan）, while working for government and company-funded research projects for 9 years as a Senior Researcher.

The approach was effective although inward-looking, and I think with the current global challenges there should have a right balance of education that could be achieved by also reaching out to the outside world. In my opinion, the future Japanese education system should also consider how to contribute to the globalization especially in the Asian region.

I am motivated by the idea that the center of world future economy is expected to shift towards the natural-resource-abundant and human-rich Asian region. Thus, development of future leaders in the region, including Japan, is inevitable. To respond to these challenges, I believe that concerted and collaborative efforts among universities in the region are necessary to develop future leading scientists, engineers and technologists. Moreover, the 21st century leaders must also heed the calls to protect the environment and to curb global warming, while ensuring food sustainability and safety.

(4) My Share on Kumamoto University's Globalization Initiatives and Efforts

I am currently working at the Department of Applied Chemistry and Biochemistry, Faculty of Advanced Science and Technology of Kumamoto University（Japan）. I also hold a concurrent position as International Research Collaborator at the

Photos to represent my current job as an educator and researcher at the Faculty of Advanced Science and Technology, Kumamoto University.

International Research Organization for Advanced Science and Technology of the same university. My diverse research interests include application of microwave and supercritical fluid technologies to biomass conversion into useful chemicals and fuels, and on the development of carbon-based materials for catalysis under microwave irradiation. Prof. Motonobu Goto（now at Nagoya University）has been a good mentor of mine on this research field. At present, I am working with Prof. Tetsuya Kida on the development of carbon-based catalysts and Assoc. Prof. Mitsuru Sasaki on biomass conversion technologies.

Part of my position as International Research Collaborator is to explore the globe to look at what science and technology can offer to improve humanity. I was also able to visit and have a short stay at various universities in Asia, US, Oceania and Europe to explore possibilities for research collaboration and academic/student exchanges including Auckland University of Technology（New Zealand）, University of Alberta（Canada）, Nottingham University（UK）, Valladolid University（Spain）, Salamanca University（Spain）, Universiti Teknologi PETRONAS（Malaysia）, Chulalongkorn University（Thailand）, King Mongkut University of Technology Thonburi（Thailand）, De La Salle University（Philippines）, University of the Philippines（Philippines）, Ateneo de Manila（Philippines）, University of Santo Tomas（Philippines）. I have also been inviting top faculty members, researchers and students from high-ranking universities in the Southeast Asian countries to experience Japanese science and technology through the support of JST Sakura Science Exchange Program.

I am currently attached to the Department of Chemical Engineering and Environmental Technology of Valladolid University, under the supervision of Prof. Maria Jose Cocero of the High Pressure Processes Group. I am working at the elucidation of the reaction mechanism of hydrolysis of bioflavonoids into aglycones by removing the sugar moieties

taking place under pressurized mixed H_2O-CO_2 system using Raman spectroscopy and advanced sample loading mechanism in high-pressure view cell. My students also join me to investigate the underlying mechanism of graphene oxide-based catalyzed reactions of (1) cellulose in synergy with microwave, (2) acetylation of limonene in supercritical CO_2 and (3) glycerol conversion under supercritical conditions under the TOBITATE Ryugaku Japan Program.

After my stint at Valladolid University, starting February (2018), I will have a new position at the College of Cross Cultural and Multidisciplinary Studies of Kumamoto University, to take in charge of the challenging job of handling the "Global Leader Course" and the globalization initiatives and efforts of Kumamoto University.

I also would like to take this opportunity to extend my sincerest gratitude to all the people who made my personal and professional career here in Japan a very successful one! I have reached the peak of my career in a country not my own, and without their help, support and encouragement I cannot attain this level of achievements. There are so many in the lists, a page or two may not be enough to mention everyone.

Selected Publications

1. Quitain AT*, Ozturk B, Mission EG, Sasaki M, "Microwave-Assisted Pressurized Hot *Water Extraction of Alkaloids," in Water Extraction of Bioactive Compounds: From Plants to Drug Development* eds. Herminia Dominguez Maria Gonzalez Munoz, Elsevier (2017).
2. EG Mission, AT Quitain*, M Sasaki, T Kida*, "Synergizing graphene oxide with microwave irradiation for efficient cellulose depolymerization into glucose", *RSC Green Chemistry* 19, 3831-3843 (2017)
3. Quitain AT, Sasaki M, Goto M*, "Biopolymer Degradation in Sub- and Supercritical Water for Biomass Waste Recycling," *Supercritical Fluid Technology for Energy and Environmental Applications*, V. Anikeev and M. Fan (ed.), Elsevier, 235-247 (2014)
4. Quitain AT*, K Oro, S Katoh, T Moriyoshi, "Recovery of Oil Components of Okara by Ethanol-Modified Supercritical CO_2 Extraction," *Biores. Tech.*, **97**, 1509-1514 (2006)
5. Quitain AT, M Faisal, K Kang, H Daimon* and K Fujie; "Low-Molecular-Weight Carboxylic Acids from Hydrothermal Treatment of Organic Wastes," *J. Hazard. Mater.*, **B93**, 209-220 (2002)
6. Quitain AT, H Itoh, S Goto*, "Reactive Distillation for Synthesizing Ethyl *tert*-Butyl Ether from Bioethanol," *J. Chem. Eng. Japan*, **32** (3), 280-287 (1999)

For more details: https://www.researchgate.net/profile/Armando_Quitain

Biography

Education

2000	DEng Chemical Engineering (Monbusho Scholar)	Nagoya University
1996	MS Chemical Engineering (With Distinction)	De La Salle University-Manila
1992	BS Chemical Engineering (With Honor)	De La Salle University-Manila
1988	High School Diploma (Valedictorian)	Santa Teresa College

Career

2018/2~	Kumamoto University	Professor
	College of Cross Cultural and Multidisciplinary Studies	
2016-2018	International Research Organization for Advanced Science and Technology	
	International Collaborative Researcher	
2010-present	Kumamoto University	Assistant Professor
	Faculty of Advanced Science and Technology	
	Department of Applied Chemistry and Biochemistry	
2001-2010	Research Institute for Solvothermal Technology	
	Senior Researcher	
2000-2001	Toyohashi University of Technology	
	JSPS Researcher	
	Department of Ecological Engineering	
1992-1996	De La Salle University-Manila	
	~Assistant Professor	