COLLABORATION WITH VIETNAM NATIONAL UNIVERSITY IN ANALYTICAL CHEMISTRY AND SOCIAL IMPLEMENTATION FOR SMART CITY

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***Keywords**: Environmental pollution, Water, Air, Analytical devices, Human resource*

Developing countries usually experience many social problems associated with rapid economic growth. Among them, environmental and food problems are the most significant issues. Due to rapid industrialization, the pollution of water and air is left untreated, and many accidents are threatening environmental and food safety and security. For example, in Vietnam, the GDP growth showed more than 6 % in 2022, despite the COVID-19 problems in the world. However, it was recently that the activities for environmental protection started. Vietnam government started to care the environmental issues when they established a basic law on environmental protection in 2014. Recently, the importance of environmental monitoring technology and human resources was emphasized, and new laws on environmental monitoring were issued in recent years.

Due to the growing awareness of environmental issues, analytical chemistry is gathering much attention. However, due to the lack of analytical technologies and instruments, the analytical chemistry education or training is not sufficient even in the top university.

Based on the background, our team at The University of Tokyo started a collaboration of analytical chemistry education in 2015 with Vietnam National University, Hanoi University of Science (VNU-HUS), which is the top university in natural sciences in Vietnam. We established a new syllabus and curriculum for analytical chemistry education in two years. With a help of the analytical industry in Japan, we could install basic analytical instruments in VNU-HUS and opened a new analytical laboratory in 2018 (Figure 1). In 2019, we could start the student practice course for 300 undergraduate students in the Faculty of Chemistry and the Faculty of Environmental Sciences.

The next step is to solve the social problems. Here, we first target environmental monitoring technology and human resource development. on-site Usually, analytical samples are transported to central analytical laboratories and analyzed. However, the analytical capacity using expensive analytical instruments is limited, and the analysis time (1-2 days) is also a significant problem when huge analytical samples are analyzed. Therefore, on-site monitoring technologies are required; however, the available technology is currently limited or they have several problems in limit of detection and cost. Our team at The University of Tokyo has strong microfluidic technologies, where analytical laboratories are integrated, and sensitive and quick analysis becomes possible with small devices. Microfluidic technologies have also a high potential for cost reduction due to the low amount of reagent consumption.

Human resource development is also another important aspect. The Vietnam government has more than 2000 central and local officers; however, the analytical training is insufficient. We agreed to establish a certified analytical training course in VNU-HUS.

With these huge demands on analytical technologies and human resources, UTokyo, VNU-HUS, and MONRE (Ministry of Natural Resouces and Environment) agreed to start a SATREPS (Science and Technology Research Partnership for Sustainable Development) project, and the proposal was accepted in 2022. The university, governments, and industries in Japan and Vietnam are involved and collaborate. The final goal is to establish a smart sensing city with analytical technologies, human resources, IoT, and data science.

In this talk, these activities are introduced, which have a relationship with “One Health One World” concept in the meaning of realizing environmental safety and security.

Figure 1 Analytical chemistry lab in VNU-HUS