

Overseas Reports

【Current Activities of a Former Participant】



Lu-san reported her current activities in China.

- 1) Course Leader: Junji KAWASAKI
- 2) Former Participant: Ms. LU Jing

October 20th, 2015


Training Division

Kitakyushu International Techno-cooperative Association

We report on activities being run by former participants playing an active role in their homeland after completing their JICA/KITA training course

This issue of Overseas Reports covers activities being run in their homeland by participants who attended the training course, “Industrial Wastewater Treatment Techniques (A)”. Junji KAWASAKI, the course leader who managed the course, introduced us their activity situation.

1. Introduction of the participant, who has given the report

Nickname	Photo	Name	Country	Period of JICA Training Course
Lu - san		Ms. LU Jing	P. R. China	Jun. 16, 2013 ~ Sep. 07, 2013



Course leader
J.KAWASAKI

Lu - san



Lu-san at a company visited in the course

Lu-san after a lecture, with participants, Mr. KAWASAKI and the coordinator

2. Message from Junji KAWASAKI, Course Leader



When we talk about environmental problems in China, we have plenty of topics like air pollution by PM2.5 and cancer villages caused by industrial wastewater. A former participant, Lu-san from China who work as a university lecturer, reported to me about her research of wastewater treatment technology.

She is trying to apply the study of wastewater treatment using Chloroperoxidase as a catalyst, which is conducted partially in Japan. However, it is rare to apply to dyeing waste water treatment because it is difficult to handle. She acquired a large amount of knowledge about theory of dyeing wastewater treatment by site visit in Japan. In this report, she tried to achieve advanced treatment.

She works at a university in Shaanxi Province which is famous for The Museum of Qin Terra-cotta Warriors and Horses located in the middle of the Yellow River in the center of inland areas of China. It is surprising that the advanced research is conducted in such areas, and this shows the effort of solving the environmental problems of present China. I believe that the environmental pollution problems will be overcome by continuing the effort.

During the training in Japan, she always kept a smile and was kind to others. I remembered her smile reading this report and felt the training in Japan blossomed into great results where we do not know well.

3. Letter from Lu-san



I work as a part-time lecturer in Shaanxi University of Science and Technology in China. I give lectures and do research in chemistry. Recently, I focus on dyeing industrial wastewater treatment and work hard with my colleagues to develop new bio reactor which is very effective and high reliability at relatively low cost as dyeing industrial wastewater treatment.

Title of Report and Contents

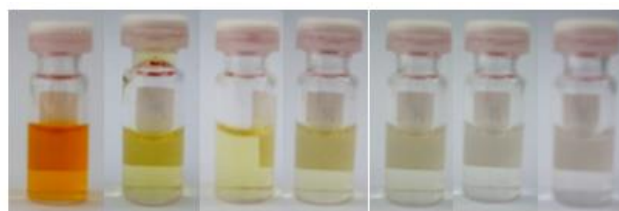
【 Immobilization of Chloroperoxidase on Materials and Its Application in Dye Decolorization 】

From 2014 to 2015, I have been doing scientific research on enzyme immobilization and its application in dye wastewater treatment.

With the development of printing and dyeing industry, the degradation of dyes in a waste stream generated by textile photography industries is a main issue in wastewater treatment. The dye wastewater is characterized with high value of COD_{Cr} complication of organic components, and high colority, which is one of the main challenges for sewage treatment, there are some defects in this current method for degradation, such as flocculation, adsorption and other physical methods and the Fenton reagent oxidation and other chemical methods, which physical methods cannot be completely degrading pollutants, and can do nothing for dyes; a variety of chemical methods exist to varying degrees of poor color removal, the treatment method is complicated and a variety of secondary pollution. However, currently used in microbial degradation due to slow degradation rate and the degradation objects is limited, the treatment pond is a large space and other factors.

Chloroperoxidase (CPO) is a heme sugar protease. It has a wide range of substrate adaptability, and now becomes the most widely used enzyme in the family of peroxidase which can be used to catalyze multiple types of reactions, such as halogenation, peroxidation, epoxidation, sulfoxidation, and hydroxylation, etc. CPO has good application prospects because of its stability, which can keep activity for 2 ~ 3 years at 4 °C. Our group has reported the outstanding performance of CPO in degradation of water-soluble dye.

At the optimum reaction condition, the decolorization efficiency of 0.1 mM crocein orange G. reached 97.31% in 5 min at the initial CPO concentration of 0.4μM; 90% of decolorization in 5 min for Alizarin Red, Crystal Violet, Orange G、 Orange IV and Alizarin Yellow. In addition, 88% in 5 min for Orange II, Metanil yellow, Congo Red. Therefore, CPO is expected to be applied in the wastewater treatment industry.



Alizarin yellow R 30s 1min 2min 3min 5min
 Fig. 1 Decoloration of Alizarin yellow R catalyzed by CPO

However, there are many difficulties in practice, such as temperature, pH of wastewater and use of organic solvents. The enzyme is easy to lose its activity in extreme conditions. At the same time, the free CPO cannot be isolated from the reaction system for reuse.

Immobilizing the enzyme molecules on a solid phase carrier is a common method to solve this problem. The carrier and immobilization methods have a vital influence on the catalytic activity of immobilized enzyme. Several materials such as mesoporous SiO₂, CaCO₃/lentinan, graphene oxide have been selected for CPO immobilization carrier in our study. The operational stabilities, including thermal stability, acid and alkali survivability, storage stability to H₂O₂ concentration, have been enhanced significantly.

At present, immobilized technology are often accompanied by aggregation of the enzyme and reducing the enzyme activity. To overcome this shortcoming, we attempt to prepare new mesoporous material as carrier which just match the size of enzyme molecule, avoiding aggregation of enzyme. We are looking forward a satisfactory result in the future.



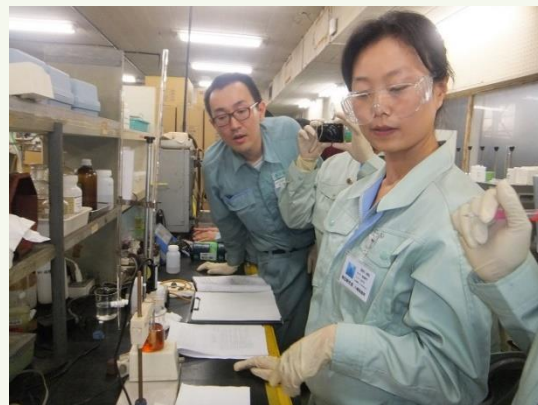
Photo Album of the JICA/KITA Training Course



Closing ceremony of “Industrial Wastewater Treatment Techniques (A)” course, September 06th, 2013



Lu-san with Kawasaki course leader



Field study at the course



The participants on a field trip



Visit to Hot spring