Contribution ID: **310** Type: **Oral presentation**

Acetylcholinesterase/gold nanoparticle/mesocellular foam silica biosensor for pesticide detection in real samples

Wednesday, May 20, 2015 2:30 PM (15 minutes)

Determination of pesticide residues in food, water, and the environment is crucial for the well-being of human and animals. This is because organophosphates and carbamates, two groups of widely applied pesticides in the agriculture, could inhibit cholinesterase enzyme which then may cause pyrolysis and finally death (Perry et al., 1998) to the livings. The main aim of this work is, therefore, to develop acetylcholinesterase (AChE)-based sensor for detection of pesticides in vegetables, fruits, and waters. Disposable screen-printed carbon and gold electrodes were both investigated as underlying substrates of modified electrodes. The electrodes were modified by immobilization of AChE in gold nanoparticle (AuNP)-decorated mesocellular foam silica (MCF), and the chitosan film was then cast over to cover the said nanoparticles. MCF is a type of mesoporous silica with remarkable specific surface area (can be up to 1,500 m2g-1;Ispas et al., 2008), appropriate pore sizes for enzyme immobilization and enhancing enzyme stability (Chouyyok et al., 2009). Moreover, incorporation of AuNPs helps enhancing electrical conductivity of the enzyme carrier. Interestingly, synergic effects between MCF and AuNPs tremendously enhanced current responses. The biosensors were tested for their performances with 4 types of pesticides, namely; chlorpyrifos, methyl parathion, carbaryl and methomyl. Primary tests with samples extracted from pesticide laden cabbage demonstrated that the biosensor could detect 500 ng/mL of methyl parathion.

References

A. Perry, S.I. Yamamoto, I. Ishaaya, R.Y. Perry, Insecticides in agriculture and environment retropspects and prospects. Narosa Publishing House, New Delhi (1998) 61.

W. Chouyyok, J. Panpranot, C. Thanachayanont, S. Prichanont, Effects of pH and pore characters of mesoporoussilicas on horseradish peroxidase immobilization, Journal of Molecular Catalysis B: enzymatic 56 (2009) 246-252.

Primary author: Mr THANANUKOOL, Nithi (Department of Chemical Engineering, Chulalongkorn University, Phayathai Road, Wangmai, Patumwan, Bangkok 10330, Thailand)

Co-authors: Ms PHONGPHUT, Angkana (Department of Chemical Engineering, Chulalongkorn University, Phayathai Road, Wangmai, Patumwan, Bangkok 10330, Thailand); Dr THANACHAYANONT, Chanchana (National Metal and Materials Technology Center (MTEC) 114 Thailand Science Park (TSP), Phahonyothin Road, KhlongNueng, KhlongLuang, PathumThani 12120, Thailand); Dr SRITONGKHAM, Pornpimol (Department of Biomedical Engineering, Faculty of Engineering, Mahidol University 999 Phutthamonthon 4 Road, Salaya, NakhonPathom 73170, Thailand); Dr PRICHANONT, Seeroong (Department of Chemical Engineering, Chulalongkorn University, Phayathai Road, Wangmai, Patumwan, Bangkok 10330, Thailand); Dr PRATONTEP, Sirapat (College of Nanotechnology, King Mongkut's Institute of Technology Ladkrabang, Chalongkrung Road, Ladkrabang, Bangkok 10520, Thailand)

Presenter: Mr THANANUKOOL, Nithi (Department of Chemical Engineering, Chulalongkorn University, Phayathai Road, Wangmai, Patumwan, Bangkok 10330, Thailand)

Session Classification: Special Session: Pesticide Biosensor (Sponsored by MTEC)

Track Classification: Biological Physics and Biomedical Engineering