

Development of an ultra-sensitive sensor utilizing optical fiber-based gold nanoparticles in bovine serum albumin (BSA) immunoassay

**Vu Thi Huong^{1,2,a}, Nguyen Tran Truc Phuong^{1,2,a}, Bach Thang Phan^{2,3},
Hanh Kieu Thi Ta^{1,2,3}, Tran Duc Trung^{2,3}, Nhu Hoa Thi Tran^{*,1,2}**

¹*Faculty of Materials Science and Technology, University of Science,
HoChiMinhCity, Viet Nam.*

²*Vietnam National University, HoChiMinh City, Viet Nam.*

³*Center for Innovative Materials and Architectures (INOMAR), HoChiMinh
City, Viet Nam.*

^aVu Thi Huong, Nguyen Tran Truc Phuong contributed equally to this work

*E-mail: ttnhoa@hcmus.edu.vn

Abstract:

Localized surface plasmon resonance (LSPR) attract tremendous attention due to their potential applications in numerous field, especially optical biosensor. In this research, the fiber biosensor based LSPR with favorable advantages as the rapid test in real time, no need label, wide concentration range, high response speed and inexpensive was developed and fabricated for the detection of bovine serum albumin (BSA). We synthesized spherical gold nanoparticles (Au NPs) with size 32 nm by seed intermediation method. By depositing a homogeneous monolayer of Au NPs on the sensing area surface of the optical fiber (length 1 cm) through amine groups, the sensor detection limit obtained for BSA can be estimated as 0.075 ng/mL. This value is considered to be better than traditional biosensors (such as ELISA, fluorescence, etc), which shows great promise in early diagnosis

Keywords: Localized surface plasmon resonance (LSPR), optical fiber, gold nanoparticles, biosensors, diagnosis.

ACKNOWLEDGMENTS. This research is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 103.03-2019.379. I would like to gratefully acknowledge the Vietnam National University in Ho Chi Minh City to Center for Innovative Materials and Architectures (Laboratory for Optics and Sensing).