Vietnam Academy of Science and Technology

National Institute for Materials Science of Japan

# The 9th International Workshop on Advanced Materials Science and Nanotechnology

## Programme and Abstracts

**Ninh Binh City, Vietnam, November 7 – 11 , 2018**

NHÀ XUẤT BẢN
THANH NIÊN

| | |
|---|---|
| | Viet Nam<br>[2]Institute of Materials Science, Viet Nam Academy of Science and Technology, 18 Hoang Quoc Viet, Ha Noi, Viet Nam |
| | **NMD-P48: Structure and electrical properties of lead-free BSZT piezoelectric thin films**<br>*Nguyen Thi Minh Phuong, Pham Thi Nguyet, Vu Thu Hien, and Vu Ngoc Hung*<br>International Training Insitute for Materials Science, Hanoi University of Science and Technology, Hanoi, Vietnam |
| | **NMD-P49: Adsorption of Hydrogen on Pt(100) surface**<br>*Thien N.N., Dao C.M., Hoa N.V. , Phi N.M. , Vi L.T. , Hanh T.T.T.*<br>Hochiminh Universiy of Technology, Hochiminh National University, Vietnam |
| | **NMD-P50: Surface reaction of thermal hydrogen with germanium/silicon**<br>*Phi N.M, Hoa N.V., Thien N.N., Dao C.M., Hanh T.T.T.*<br>Hochiminh Universiy of Technology, Hochiminh National University, Vietnam |
| | **NMD-P51: Metamaterial based conical frustum array nanostructure for wide-angle and polarization-ınsensitive absorber in the visible region**<br>*Tran Sy Tuan, Nguyen Thi Minh, Nguyen Hong Quang, Phan Duy Tung, Nguyen Thi Quynh Hoa*<br>Vinh University, Vietnam |
| | **NMD-P52: Study on negative permittivity metamaterial based on CSRR structure and its application in improving performances of MIMO antenna**<br>*Tran Sy Tuan, Phan Duy Tung, Nguyen Phuc Ngoc, Nguyen Thi Quynh Hoa*<br>Vinh University, Vietnam |
| | **NMD-P53: Fabrication of an electrode functional layer on an electrolyte-supported solid oxide fuel cell by electro hydrodynamic jet printing technique**<br>*Thu Thi Pham[1], Kubota Atsushi[1,2], Tin Chanh Duc Doan[1], and Mau Chien Dang[1]*<br>[1]Institute for Nanotechnology (INT), Vietnam National University - Ho Chi Minh City, Vietnam<br>[2]Graduate school of Engineering, Kyushu University, Japan |
| | **NMD-P54: Improve the performance of nanowire solar cells based on wire connection without any transparent conducting electrode**<br>*Le Duc Toan[1], Jemee Joe[2] and Young Woo Kim[2]*<br>[1]Phu Yen University<br>[2]Sungkyunkwan University |
| | **NMD-P55: Structural and magnetic properties of $BaFe_{12-x}Co_xO_{19}$ hexaferrites nanoparticles**<br>*Ngo Tran, T. L. Phan, B. W. Lee*<br>Department of Physics and Oxide Research Center, Hankuk University of Foreign Stuides, Yongin 17035, South Korea |

**NMD-P50**

# SURFACE REACTION OF THERMAL HYDROGEN WITH GERMANIUM/SILICON

**Phi N. M., Hoa N. V. , Thien N. N., Dao C. M., Hanh T. T. T.***
Hochiminh Universiy of Technology, Hochiminh National University, Vietnam
***E-mail:** thuhanhsp@hcmut.edu.vn

## ABSTRACT

The DFT study of reactions of H with Ge(100) were investigated with different temperatures using SIESTA calculation. The onsite stable positions have been found. The phonon frequency of H on surface also have been study, the ZPE of system was calculated. The computational results have been then compared with H/Si adsorption model.

**NMD-P51**

# METAMATERIAL BASED CONICAL FRUSTUM ARRAY NANOSTRUCTURE FOR WIDE-ANGLE AND POLARIZATION-INSENSITIVE ABSORBER IN THE VISIBLE REGION

**Tran Sy Tuan*, Nguyen Thi Minh, Nguyen Hong Quang, Phan Duy Tung, Nguyen Thi Quynh Hoa**
Vinh University, Vietnam
***E-mail:** tuants@vinhuni.edu.vn

## ABSTRACT

Perfect absorber based on electromagnetic metamaterial (MA) has been studied extensively to enhance the efficiency in harvesting solar energy, wireless power transfer. In particular, the controllable absorption bandwidth has been of great interest because many applications require a defined broadband absorption. Recently, several approaches have been used successfully to extend the absorption band including using combination of various unit cells with two-dimensional patterns and stacking metallic-dielectric multilayers. Compared with the stacking design, the two-dimensional pattern design has disadvantage because the number of resonance combinations is limited.

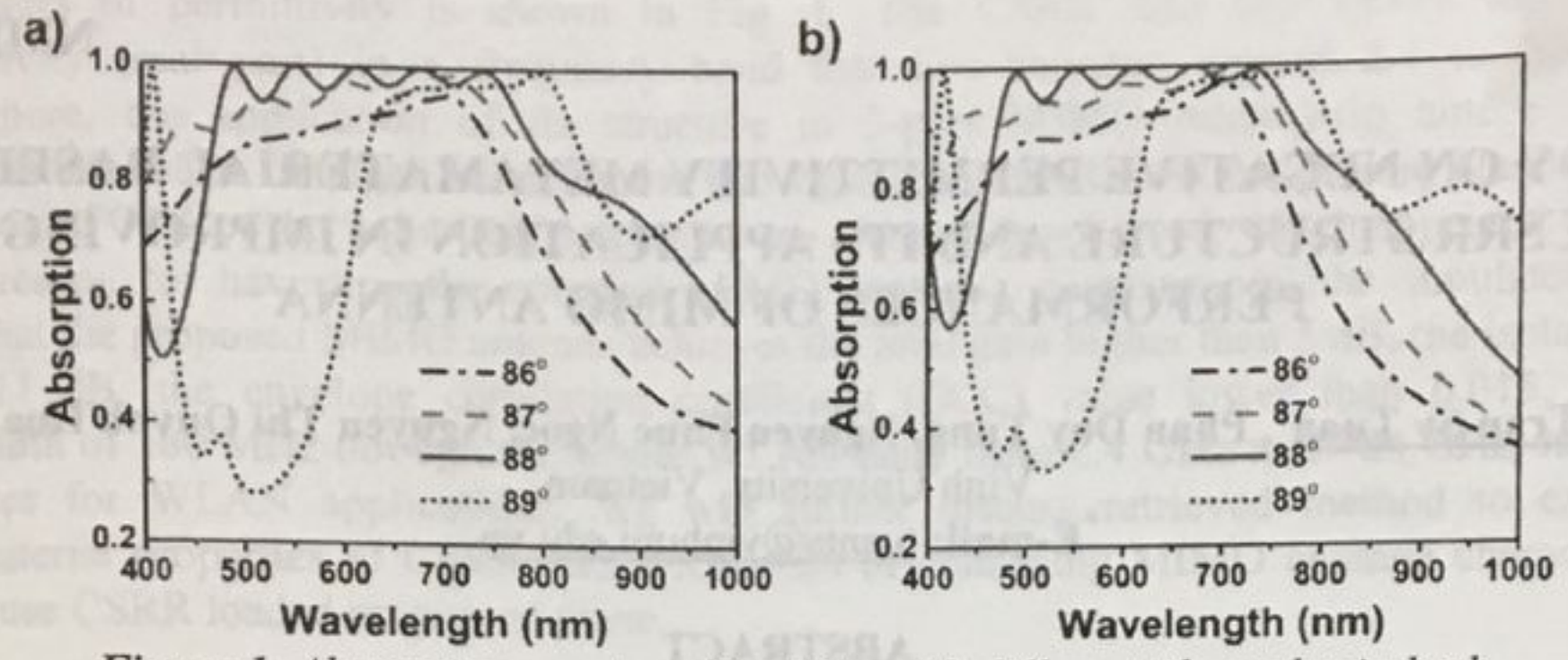


***Figure 1.*** *Absorption spectra of the MAs with different tilt angles in both a) TE mode and b) TM mode.*

Therefore, most studies, by means of simulation as well as experiment, on broadband MA have been focused on the stacking design. However, these studies have been limited mainly to controlling the bandwidth by changing the number of metallic-layers or using different size of the stacks. Both are relatively complicated in practice and entail high fabrication cost. Furthermore, little information is available on the effect of other structural parameters on the bandwidth as well as absorption characteristics of MA, such as incident angle and polarization. In this paper, we report a simple approach for design of an ultra-broadband MA in the visible region using a periodic array of metallic-dielectric multilayered conical frustums. The bandwidth and absorption properties of the MA can be controlled by turning the structural parameters such as tilt angle and lattice constant. The design and it parameters are evaluated by means of numerical simulation.

The obtained results reveal that the bandwidth and absorption performance can be controlled via varying the tilt angle and the lattice constant of the conical frustums. With the optimized tilt angle of 88° and lattice constant of 150 nm, the absorption efficiencies are greater than 80 % of the light from 474.4 nm to 784.4 nm with large incidence angles up to 65° as shown in Fig. 1. Furthermore, the perfect polarization independence is obtained due to rotational symmetry of the structure. The results obtained demonstrate that the designed absorber has a promising potential for application in the visible region.

This research is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 103.02-2017.367.