



THE 10TH INTERNATIONAL WORKSHOP
ON ADVANCED MATERIALS
SCIENCE AND NANOTECHNOLOGY

PROGRAMME & ABSTRACTS



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**THE 10TH INTERNATIONAL WORKSHOP ON
ADVANCED MATERIALS SCIENCE AND
NANOTECHNOLOGY**

IWAMSN 2021

NOVEMBER 4th – 6th, 2021

PAN PACIFIC HANOI, VIETNAM

PROGRAMME & ABSTRACTS

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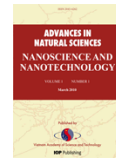
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TOPICS OF THE WORKSHOP

1. Nanostructured Materials and Devices (code: NMD)
2. Materials for Electronics and Photonics (code: MEP)
3. Advanced Engineering Materials (code: AEM)
4. Advanced Materials and Nanotechnologies for Energy, Life Science, and Environment Technology (code: ELE)

Nanostructured Materials and Devices (NMD) Venue: Pacific 1	
November 5th, 2021	
NMD-1 Chairmen: Nguyen Duc Chien and Nguyen Thi Ngoc Anh	
08:30-09:00	NMD-K01: Metallic hydrogen and super-hydrides: How real is room temperature superconductivity? <u>Mukunda P. Das</u> Department of Theoretical Physics, Research School of Physics, The Australian National University, Australia
09:00-09:25	NMD-I01: Magnetic refrigeration and machine-learning-aided discovery of HoB ₂ : A promising candidate for working material <u>K. Terashima¹, P. B. Castro^{1,2}, T. D. Yamamoto¹, Z. Hou³, H. Takeya¹, and Y. Takano^{1,2}</u> ¹ National Institute for Materials Science (NIMS), Japan ² University of Tsukuba, Japan ³ Chinese Academy of Sciences, China
09:25-09:40	NMD-O01: Polaron transport in molecular junctions: Contact effects and molecular signature <u>Quyên Van Nguyen¹, Pascal Martin², Richard L. McCreery³, and Jean-Christophe Lacroix²</u> ¹ Department of Advanced Materials Science and Nanotechnology, University of Science and Technology of Hanoi (USTH), Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam ² Université Paris Diderot, Sorbonne Paris Cité, ITODYS, UMR 7086 CNRS, 15 rue Jean Antoine de Baïf, 75205 Paris Cedex 13, France ³ University of Alberta, 11421 Saskatchewan Dr. Edmonton, AB T6G 2M9, Canada, National Institute for Nanotechnology, 11421 Saskatchewan Dr. Edmonton, AB T6G 2M9, Canada
09:40-09:55	NMD-O02: Anisotropic optical properties of biaxial single-crystal α -SnS <u>Long V. Le¹, Hoang T. Nguyen^{1,2}, Xuan A. Nguyen², Tae J. Kim², and Young D. Kim²</u> ¹ Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam ² Department of Physics, Kyung Hee University, Seoul 02447, Republic of Korea
	Break
NMD-2 Chairmen: Nguyen Duc Chien and Nguyen Thi Ngoc Anh	
10:15-10:45	NMD-K02: Quantum transport properties in graphene/hexagonal boron nitride moiré superlattices <u>Takuya Iwasaki</u> International Center for Materials Nanoarchitectonics (MANA), National

	Vietnam
	<p>NMD-P36: Numerical investigation of surface plasmon resonances enabled in 2D metal-dielectric-metal nanostructures <u>Thu Trang Hoang</u>¹, <u>Thanh Son Pham</u>¹, and <u>Quang Minh Ngo</u>² ¹Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam ²University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, Vietnam</p>
	<p>NMD-P37: Preparation and characterization of Vietnamese refined cashew nut shell liquid <u>Binh Hai Nguyen</u>¹, <u>Vo Thanh Phong</u>², <u>Vu Ngoc Linh</u>³, <u>Nguyen Hong Nam</u>⁴, <u>Nguyen Duc Tho</u>⁵, and <u>Pham Chi Hoa</u>⁶ ¹Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam ²Central propaganda and training commission, Vietnam ³University of Engineering and Technology, Vietnam National University-Hanoi, Vietnam ⁴University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, Vietnam ⁵National Agency for Science and Technology Information, Vietnam ⁶National Technology Innovation Foundation, Ministry of Science and Technology, Vietnam</p>
	<p>NMD-P38: Fabrication and applications of transparent nanostructured electrodes <u>Tien Dat Doan</u>^{1,2}, <u>Nguyen Thi Thu Hien</u>¹, <u>Hac Thi Nhung</u>^{1,2}, <u>Ho Thi Oanh</u>^{1,2}, <u>Dinh Long Phan</u>^{1,3}, and <u>Mai Ha Hoang</u>^{1,2} ¹Institute of Chemistry, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam ²Graduate University of Science and Technology, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Cau Giay, Hanoi, Vietnam ³College of Economics, Industry and Commerce, 569 Quang Trung, Thanh Hoa, Vietnam</p>
	<p>NMD-P39: Development the novel enzyme sensor based on DWCNTs/graphene hybrid film for trace detection of the carbaryl pesticide <u>Binh Hai Nguyen</u>¹, <u>Nguyen Phan Duc Duoc</u>^{1,2,3}, <u>Cao Thi Thanh</u>¹, <u>Pham Van Trinh</u>¹, <u>Nguyen Van Chuc</u>¹, and <u>Vu Duy Tung</u>⁴ ¹Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam ²University of Engineering and Technology, Vietnam National University - Hanoi, Vietnam ³Nha Trang University, Vietnam ⁴VNU University of Science, Vietnam National University-Hanoi, Vietnam</p>
	<p>NMD-P40: Study on fabrication of Fe₃O₄@Au nanoparticles for dual-mode MR/CT imaging applications</p>

	<p><i>Nguyen Hoa Du¹, Le The Tam¹, Nguyen Thi Ngoc Linh², Phan Thi Hong Tuyet¹, Ho Dinh Quang¹, and Pham Hong Nam³</i></p> <p>¹Vinh University, 182 Le Duan, Vinh, Vietnam ²Thai Nguyen University of Sciences, Vietnam ³Institute of Materials Science, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet, Hanoi, Vietnam</p>
	<p>NMD-P41: Functionalization of the magnetic octagonal Fe₃O₄ nanoparticles for CEA cancer marker counting by using planar Hall sensor <i>Binh Hai Nguyen¹, Vu Xuan Manh^{2,3}, Tran Van Hiep^{2,3}, Pham Van Nhat⁴, Bui Dinh Tu³, and Hiroya Abe⁵</i></p> <p>¹Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam ²Center for Microelectronics and Information Technology, National Center for Technological Progress, Vietnam ³University of Engineering and Technology, Vietnam National University-Hanoi, Vietnam ⁴University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, Vietnam ⁵Joining and Welding Research Institute, Osaka University, Japan</p>
	<p>NMD-P42: In-flow detection of magnetic nanoparticles by wheatstone bridge-giant magnetoresistance sensor <i>Vu Xuan Manh^{1,2}, Phạm Ngọc Thảo¹, Nguyen Minh Hieu³, Nguyen Hoang Hai³, Bui Thanh Tung¹, and Chu Duc Trinh¹</i></p> <p>¹Faculty of Electronics and Telecommunications, VNU University of Engineering and Technology, Vietnam ²National Center for Technological Progress, Ministry of Science and Technology, Vietnam ³Nano and Energy Center, VNU University of Science, Vietnam</p>
	<p>NMD-P43: Temperature-dependent photoluminescence of CdS/ZnSe core/shell heterostructures <i>Nguyen Dieu Linh¹, Nguyen Thi Thuy Lieu², Nguyen Thi Minh Hien³, Nguyen Xuan Ca⁴, and Nguyen Xuan Nghia³</i></p> <p>¹University of Science and Technology of Hanoi, Vietnam Academy of Science and Technology, Vietnam ²Posts and Telecommunications Institute of Technology, Vietnam Academy of Science and Technology, Vietnam ³Institute of Physics, Vietnam Academy of Science and Technology, Vietnam ⁴Thai Nguyen University of Science, Vietnam</p>
	<p>NMD-P44: Synthesis and microwave absorption properties of lead-free Bi_{0.5}(Na_{0.80}K_{0.20})_{0.5}TiO₃ by sol-gel method <i>Co Dang Nguyen¹, Huy Duc Tran¹, Hiep Van Tran¹, Thuy Thu Bui¹, Viet Quoc Dong¹, Dung Thi Nguyen¹, Cuong Viet Le¹, Binh Hai Nguyen⁴, Dung Duc Dang³, Quan Duc Ngo³, Thang Duc Pham¹, and Tu Dinh Bui¹</i></p> <p>¹Faculty of Engineering Physics and Nanotechnology, VNU University of</p>

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NMD-P39

DEVELOPMENT THE NOVEL ENZYME SENSOR BASED ON DWCNTs/GRAPHENE HYBRID FILM FOR TRACE DETECTION OF THE CARBARYL PESTICIDE

**Binh Hai Nguyen¹, Nguyen Phan Duc Duoc^{1,2,3}, Cao Thi Thanh¹, Pham Van Trinh¹,
Nguyen Van Chuc¹, and Vu Duy Tung⁴**

¹*Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam*

²*University of Engineering and Technology, Vietnam National University-Hanoi, Vietnam*

³*Nha Trang University, Vietnam*

⁴*Hanoi University of Science, Vietnam National University-Hanoi, Vietnam*

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ABSTRACT

The development of the novel electrochemical enzyme sensor based on hybrid Double-walls carbon nanotube/Graphene (DWCNTs/Gr) film was reported in this paper. The hybrid DWCNTs/Gr was synthesized by thermal chemical vapor deposition method and was transferred on the surface of electrochemical electrode. The urease enzyme was immobilized on the surface of hybrid film by cross-linking method via glutaraldehyde. The electroactivity of the urease sensor was investigated by CV spectrum, SWV spectrum and Kelvin-Probe Force method. Based on the inhibition reaction of carbaryl with urease enzyme, the concentration of carbaryl pesticide was determined by the change of output current of developed sensor. The obtained results showed that sensitivity as 0,96 mA/ppb with LOD as 0.2 ppb in range from 0-10 ppb. These results open up the paths for developing the label-free electrochemical sensor for environmental monitoring.

Keywords: *Enzyme sensor, urease, DWCNTs, Graphene, carbaryl.*

NMD-P40

STUDY ON FABRICATION OF Fe₃O₄@Au NANOPARTICLES FOR DUAL-MODE MR/CT IMAGING APPLICATIONS

**Nguyen Hoa Du¹, Le The Tam¹, Nguyen Thi Ngoc Linh², Phan Thi Hong Tuyet¹,
Ho Dinh Quang¹, and Pham Hong Nam³**

¹*Vinh University, 182 Le Duan, Vinh, Vietnam*

²*Thai Nguyen University of Sciences, Vietnam*

³*Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam*

Email: tamlt@vinhuni.edu.vn

ABSTRACT

In this work, facile two-step approach to synthesizing Fe₃O₄@Au core-shell hybrid nanoparticles (HNPs) by thermal decomposition method for dual-mode magnetic resonance (MR) and

computed tomography (CT) imaging applications is reported. Based on obtained Fe₃O₄ high degree of crystallization nanoparticles with uniform particle size used as seeds, we fabricated core-shell Fe₃O₄@Au hybrid nanoparticles (HNPs) with an average size less than 20 nm, monodispersity. MR and CT imaging data reveal that the formed Fe₃O₄@Au HNPs have a relatively high r_1 , r_2 relaxivity (4.26 mM⁻¹s⁻¹ and 116.08 mM⁻¹s⁻¹ in PBS, respectively) and good X-ray attenuation property, which enables their uses as contrast agents for MR imaging and CT imaging in clinical. *In-vivo* test result in mouse shows that the materials can be used as contrast agents for MR and CT imaging of liver and CT imaging of heart of mouse. The Fe₃O₄@Au HNPs developed via the facile two-step approach may have promising potential for the dual-mode MR/CT imaging of different biological systems.

Keywords: *Iron oxide nanoparticles, gold nanoparticles, thermal decomposition synthesis, dual mode, magnetic resonance imaging (MRI) and computed tomography imaging (CT).*

NMD-P41

FUNCTIONALIZATION OF THE MAGNETIC OCTAGONAL Fe₃O₄ NANOPARTICLES FOR CEA CANCER MARKER COUNTING BY USING PLANAR HALL SENSOR

**Binh Hai Nguyen¹, Vu Xuan Manh^{2,3}, Tran Van Hiep^{2,3}, Pham Van Nhat⁴,
Bui Dinh Tu³, and Hiroya Abe⁵**

¹*Institute of Materials Science, Vietnam Academy of Science and Technology, Vietnam*

²*Center for Microelectronics and Information Technology,
National Center for Technological Progress, Vietnam*

³*University of Engineering and Technology, Vietnam National University-Hanoi, Vietnam*

⁴*University of Science and Technology of Hanoi,*

Vietnam Academy of Science and Technology, Vietnam

⁵*Joining and Welding Research Institute, Osaka University, Japan*

Email: binhnh@ims.vast.ac.vn

ABSTRACT

In this paper, the octagonal magnetic nanoparticles (oct-MNPs) was functionalized and applied for determine the CEA cancer marker by using the planar Hall sensor. The oct-Fe₃O₄ nanoparticles were synthesized by polyol method via the reduction of a-FeOOH solid precursors in EG containing 12 % volume water at 200 °C for 48h. The Fe₃O₄ particles was functionalized by chitosan with the assistance of ultrasonication for 1h. The CEA-antigen was immobilized on the surface of oct-Fe₃O₄ nanoparticles. The FESEM image and DLS results shows that the size of Fe₃O₄ nanoparticles with chitosan films about 100 nm. The PDMS microfluidic was integrated with a planar Hall sensor to determine the magnetic signal of functionalized oct-MNPs. The number of CEA marker was detected by the change of the output signal of employed system. The obtained results showed that the developed sensor has linearly responded with CEA marker concentration with LOD as 6,7 mg/mL in range from 0-100 mg/mL.

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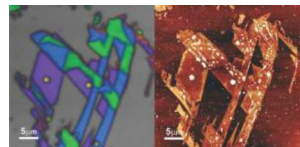
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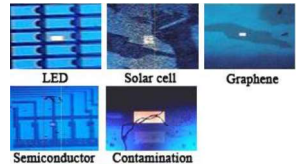
Raman-AFM co-localization image of graphene



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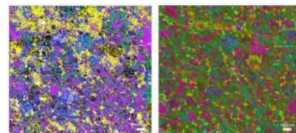
Real-time colour image of the sample and exact measurement spot



X-Ray Analytical Microscope
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Key applications:

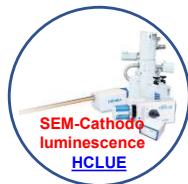
- Non-destructive failure analysis on electronic components
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Maps of meteorite. (Left) Chemical Raman map. (Right) Elemental X-ray Fluorescence map



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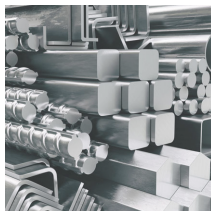
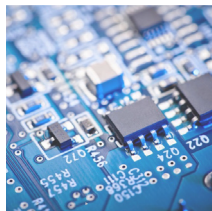
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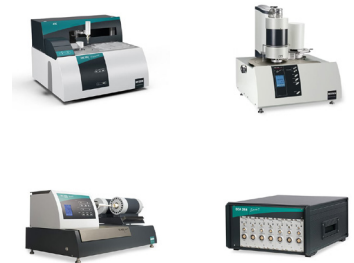
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