

INFORMATION ON DOCTORAL THESIS

1. Full name: Tran Van Hau 2. Sex: male
3. Date of birth: 08/24/1991 4. Place of birth: Hue city
5. Admission decision number: 778 QD-CTSV Dated 08/21/2017.....
6. Changes in academic process:
 - Adjusting supervisor and topic of the doctoral thesis followed the Decision No. 340/QD-DT, dated 04/03/2019.
 - Adjusting the title of the doctoral thesis followed the agreement of the first doctoral thesis evaluation council, dated 10/22/2021.
7. Official thesis title: Fabrication and investigation of reinforcement properties of nano electroplating containing graphene.....
8. Major: Nanomaterials and devices 9. Code: 944012801QTD
10. Supervisors:
 1. Supervisor 1: Assoc.Prof.Dr. Nguyen Phuong Hoai Nam
 2. Supervisor 2: Dr. Bui Hung Thang
11. Summary of the **new findings** of the thesis:

The main results of the thesis were shown in contents mentioned below. These contents were the new contributions of the thesis

 - Optimization of the GNPs material-reinforced nickel electroplating fabrication process.
 - High energy ball-milling process in 5 hours can reduce GNPs size from around 5 μm to about 200 nm, whereas GNPs thickness declines from 12 nm to 1,49 nm. In addition, specific surface area increases to 555 %. High energy ball-milling process in 5 hours doesn't influence significantly on the nanostructure of GNPs materials.
 - The functionalized GNPs materials are dispersed into distilled water which has reached a stable dispersion with the zeta potential value of 29,2 mV.
 - The non-functionalized GNPs materials are not able to reinforce nickel coating. The non-functionalized GNPs material reinforced nickel coating has a microhardness of 130 ± 8 HV which is lower 57 HV than Ni coating.

- The functionalized GNPs material reinforced Ni coating has a higher microhardness compared to Ni coating from 42 HV to 86 HV, which depends on GNPs material size.
- GNPs material size effect significantly on enhance ability microhardness, wear and corrosion resistance properties of the functionalized GNPs material reinforced Ni coating. The microhardness, wear and corrosion resistance properties of Ni composite coating are enhanced with the reduction of GNPs material size. Ni/GNPs5 coating has the highest microhardness (273 HV), the lowest wear rate ($13,2 \times 10^{-4} \text{ mm}^3/\text{N.m}$), the highest anti-corrosion with a corrosion current density of $1,16 \times 10^{-7} \text{ A/cm}^2$, the corrosion potential of 0,1661 V. The lowest mass lost which reduces to 55,27% compared to Ni coating after salt spray test.

12. Practical applicability, if any: Cooperated and piloted production at T&C Vietnam Co., Ltd.

13. Further research directions, if any: Research and testing to optimize manufacturing processes at an industrial scale.

14. Thesis-related publications:

List of publications in SCI journals

1. Tran Van Hau, Pham Van Trinh, Nguyen Phuong Hoai Nam, Vu Dinh Lam, Phan Ngoc Minh and Bui Hung Thang (2019), Enhanced Hardness of Niken Coating Reinforced Functionalized Carbon Nanomaterials via an Electrodeposition Technique, Mater. Res. Express 6 0850c4 (IF = 1.620)
2. Tran Van Hau, Pham Van Trinh, Nguyen Phuong Hoai Nam, Nguyen Van Tu, Vu Dinh Lam, Doan Dinh Phuong, Phan Ngoc Minh, Bui Hung Thang (2020), Electrodeposited niken–graphene nanocomposite coating: effect of graphene nanoplatelet size on its microstructure and hardness, RSC. Adv. 10 22080-22090 (IF = 3.361)
3. Tran Van Hau, Pham Van Trinh, Nguyen Phuong Hoai Nam, Nguyen Van Tu, Phan Nguyen Duc Duoc, Mai Thi Phuong, Doan Dinh Phuong, Vu Dinh Lam, Phan Ngoc Minh, Bui Hung Thang (2021), Electrodeposited niken–graphene nanocomposite coating: influence of graphene nanoplatelets size on wear resistance and anti-corrosion property, Appl. Nanosci. 11 11481-1490 (IF=3.674)

List of publications in national journals

1. Trần Văn Hậu, Phạm Văn Trinh, Nguyễn Phương Hoài Nam, Cao Thị Thanh, Vũ Đình Lâm, Phan Ngọc Minh, Bùi Hùng Thắng (2019), Ứng dụng phương pháp nghiền bi năng lượng cao để nâng cao hiệu quả phân tán vật liệu graphen đa lớp

trong chất lỏng, Tạp chí Khoa học Đại học Huế: Khoa học Tự nhiên, Tập 128, số 1C, 35-4.

List of publications in national and international conferences

1. Tran Van Hau, Nguyen Viet Phuong, Vu Dinh Lam, Phan Ngoc Hong, Phan Hong Khoi, Phan Ngoc Minh, Bui Hung Thang, (2018), Enhancing Metallic Hardness by Using The Nickel-Graphene Nanocomposite Coating, Proceedings of ACCMS-Theme Meeting on Multiscale Modelling of Materials for Sustainable Development (ACCMS-TM 2018), 7-9th September 2018, Hanoi, Vietnam, pp. 232.
2. Tran Van Hau, Nguyen Viet Phuong, Vu Dinh Lam, Phan Ngoc Hong, Phan Hong Khoi, Phan Ngoc Minh, Bui Hung Thang, (2018), Effect of multiwalled carbon nanotubes concentrations on hardness, thickness and the surface morphology of nickel-graphene/multiwalled carbon nanotubes nanocomposite coating, Proceedings of 3rd International workshop on corrosion and protection of materials, 18-21st, Hanoi, Vietnam, pp. 68.
3. Tran Van Hau, Nguyen Viet Phuong, Vu Dinh Lam, Phan Ngoc Hong, Phan Hong Khoi, Phan Ngoc Minh, Bui Hung Thang, (2018), Enhancing of hardness and corrosion resistance nickel coating by using the graphene/multi-walled carbon nanotubes additive, Proceedings of The 9th International Workshop on Advanced Materials Science and Nanotechnology, November 7 -11, Ninh Binh, Vietnam, pp. 212-213

List of patent registration

No.	Authors	Title of patent registration	Code	Decision date
1	Bui Hung Thang, Tran Van Hau, Pham Van Trinh, Nguyen Phuong Hoai Nam, Phan Ngoc Minh, Vu Dinh Lam	Technological process for making graphene-reinforced nickel electroplating	1-2018-05838	Intellectual properties offices of Vietnam provided on January, 23, 2019.
2	Bui Hung Thang, Tran Van Hau, Nguyen Phuong Hoai Nam, Phan Ngoc Minh, Vu	Thiết bị và quy trình chế tạo lớp mạ điện kim loại gia cường vật liệu	1-2019-01259	Intellectual properties offices of Vietnam provided on April, 12, 2019.

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