**Plenary/invited talk ‘s Information**

*(Submission Deadline: October 30th, 2023)*

## 1.Your information

a. Title of talk: New transfer technique for graphene and other 2D materials on Si substrates for electronic devices

b. Full name of speaker: Pham Thanh Trung

*- Academic title: Postdoctoral researcher*

*- Your presentation (please select and put X):*

|  |  |  |  |
| --- | --- | --- | --- |
|  | *Plenary talk* | *X* | *Invited talk* |

*- E-mail: trung.phamthanh@unamur.be Handphone:.+32-487 11 62 09*

*- Institution (lab/center/faculty, university, city, country*):

Lab for physics of electronic materials, Namur Institute of Structured Matter (NISM), Department of Physics, University of Namur, Belgium

c. Co-Author (if exitence)

\*1st Co-author:

*. Full name (English): Robert Sporken*

*. Institution (lab/center/faculty, university, city, country):* Lab for physics of electronic materials, Namur Institute of Structured Matter (NISM), Department of Physics, University of Namur, Belgium

\*2nd Co-author:

*. Full name (English):*

*. Institution (lab/center/faculty, university, city, country):*

\*3rd Co-author:

*. Full name (English):*

*. Institution (lab/center/faculty, university, city, country):*

*…*

## 2. Your Abstract

Abstract: *(Preferably detail abstract, include figures and references in ONE A4 page, size 13, Times New Roman, maximum of 200 words)*

Graphene has been proposed as a promising alternative to silicon-based electronics due to its outstanding electrical, optical, thermal, and mechanical properties [1-4]. It opens up new possibilities not only for fundamental physics research but also for applications. Since silicon is still the most important single-crystal substrate used for semiconductor devices and integrated circuits, integration of graphene into the current Si technology is highly desirable. A combination of graphene and silicon may overcome the traditional limitations in scaling down of devices that silicon based technology is facing [5]. In this context, graphene on Si might be one of the most promising candidates as a material for graphene-based technology beyond CMOS. Therefore, it is crucial to find a process to grow or transfer graphene directly on Si. However, direct growth of graphene on Si produces very poor crystalline quality and it is difficult to build vertial heterostructures.

To date, significant advances in graphene synthesis methods have been made and in particular, CVD (chemical vapor deposition) can produce graphene films with high structural quality on copper substrates (copper foils are commonly used for their low cost and high availability) [6, 7]. To expand the possible applications, chemical vapor deposition grown graphene needs to be transferred to appropriate substrate such as silicon wafer. Although enormous efforts are devoted to transfer graphene on various substrates using many different methods, the quality of the final product is still insufficient. In this context, we develop a new process under a combination of wet etching and dry transfer to obtain graphene on Si with a clean interface between the graphene and the substrate. Using various analysis techniques such as low energy electron diffraction, scanning electron microscopy, scanning tunneling microscopy/spectroscopy, Raman, Auger electron spectroscopy and X-ray photoelectron spectroscopy, we demonstrate that our transferred graphene on Si is continuous, clean and that it is very promising for device fabrication.

\*Keywords (max: 5): Graphene, 2D materials, graphene transfer, graphene on Si

\*References (max: 10):

[1] K. Novoselov, A. K. Geim, S. Morozov, et al., Two-dimensional gas of massless Dirac fermions in graphene, Nature 438, 197 (2005).

[2] R. R. Nair, P. Blake, A. N. Grigorenko, et al., Fine Structure Constant Defines Visual Transparency of Graphene, Science 320, 1308 (2008).

[3] A. A. Balandin, S. Ghosh, W. Bao, et al., Superior thermal conductivity of single-layer graphene, Nano Letters 8, 902 (2008).

[4] C. Lee, X. Wei, J. W. Kysar, and J. Hone, Measurement of the elastic properties and intrinsic strength of monolayer graphene, Science 321, 385 (2008).

[5] K. Kim, J.-Y. Choi, T. Kim, S.-H. Cho, et al., A role for graphene in silicon-based semiconductor devices, Nature 479, 338 (2011).

[6] S. Bae, H. Kim et al., Roll-to-roll production of 30-inch graphene films for transparent electrodes, Nature Nanotechnology 5, 574-578 (2010).

[7] G. Deokar, J. Avila et al., Towards high quality CVD graphene growth and transfer, Carbon 89, 82-92 (2015).

## 3. Publications

Please let us know your idea (put X) about the publication of your talk in this 4ICEBA2023:

|  |  |
| --- | --- |
| *X* | **Non-Publication;** |

Your power point or PDF file of presentation must be to [4iceba2023@gmail.com](mailto:4iceba2023@gmail.com) before November 15th, 2023.

|  |  |
| --- | --- |
|  | **Publication:** |

- Your full paper with 4-8 pages (using the full paper template of 4ICEBA2023) send to [4iceba2023@gmail.com](mailto:4iceba2023@gmail.com) before **November 15th, 2023** for the peer-review proceess of session presentation.

- Moreover, please select 1 of 4 below Journal which you want to be published. After the 4ICEBA2023, the scientific committee will recommend which jounal will be better for your paper. Then, your up dated full paper must submit to website of journal (with its full paper template) for the review process before **December 30th, 2023.** We will inform you about thepublication fee (see its payment instructions firstly). Therefore, your paper will be published as early as February or March 2024.

|  |  |
| --- | --- |
|  | **IEEJ Transactions on Electrical and Electronic Engineering (Scopus, Q3):** |

*. The Institute of Electrical Engineers of Japan*

## *. ISSN: 19314973/Online ISSN:1931-4981*

## *. IF (2022):1.0*

## *. SJR 0.35(2022), Scopus-SJR, Q3 (https://www.scimagojr.com)*

## *.* [*https://onlinelibrary.wiley.com/journal/19314981*](https://onlinelibrary.wiley.com/journal/19314981)

*.* [*Payment Instructions*](file:///E:\Du%20lieu%20USP_7.10.2021\5.%20Nghien%20cuu%20khoa%20hoc\Hoi%20nghi%20va%20bai%20bao\2023\4thICEBA2023\Payment%20Instructions)*:* [*https://www.iee.jp/wp-content/uploads/honbu/data-9014/ta04.pdf*](https://www.iee.jp/wp-content/uploads/honbu/data-9014/ta04.pdf)

|  |  |
| --- | --- |
|  | IEEJ Transactions on Sensors and Micromachines (Scopus, Q4): |

*. The Institute of Electrical Engineers of Japan*

## *. ISSN:13475525, 13418939*

*. SJR 0.21(2022), Q4 (https://www.scimagojr.com)*

## *.* [*https://www.jstage.jst.go.jp/browse/ieejsmas/\_pubinfo/-char/en*](https://www.jstage.jst.go.jp/browse/ieejsmas/_pubinfo/-char/en)

*.* [*Payment Instructions*](file:///E:\Du%20lieu%20USP_7.10.2021\5.%20Nghien%20cuu%20khoa%20hoc\Hoi%20nghi%20va%20bai%20bao\2023\4thICEBA2023\Payment%20Instructions)*:* [*https://www.iee.jp/wp-content/uploads/honbu/data-9014/ta04.pdf*](https://www.iee.jp/wp-content/uploads/honbu/data-9014/ta04.pdf)

|  |  |
| --- | --- |
|  | Applied Sciences (MDPI, Scopus, IF: 2.9, Q1/Q2): |

*. Switzerland,* [*Multidisciplinary Digital Publishing Institute-MDPI*](https://www.scimagojr.com/journalsearch.php?q=Multidisciplinary%20Digital%20Publishing%20Institute%20(MDPI)&tip=pub)*)*

*.* [*Open Access*](https://www.mdpi.com/openaccess)*-free for readers, with*[*article processing charges (APC)*](https://www.mdpi.com/journal/applsci/apc)*paid by authors or their institutions.*

*. Indexed within*[*Scopus*](https://www.scopus.com/sourceid/21100829268?origin=sbrowse#tabs=0)*,*[*SCIE (Web of Science)*](https://mjl.clarivate.com/search-results?issn=2076-3417&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal)*,*[*Inspec*](https://www.theiet.org/publishing/inspec/inspec-content-coverage/)*,*[*CAPlus / SciFinder*](https://sso.cas.org/as/authorization.oauth2?response_type=code&client_id=scifinder-n&redirect_uri=https%3A%2F%2Fscifinder-n.cas.org%2Fpa%2Foidc%2Fcb&state=eyJ6aXAiOiJERUYiLCJhbGciOiJkaXIiLCJlbmMiOiJBMTI4Q0JDLUhTMjU2Iiwia2lkIjoianMiLCJzdWZmaXgiOiJUYWozcGUu)*, and*[*other databases*](https://www.mdpi.com/journal/applsci/indexing)*.*

*. ISSN:13475525, 13418939*

*. IF (2022):2.7*

*. JCR-Q2 (Engineering, Multidisciplinary)/CiteScore-Q1 (General Engineering).*

*.* [*Payment Instructions*](Payment%20Instructions)*:* [*https://www.mdpi.com/journal/applsci/apc*](https://www.mdpi.com/journal/applsci/apc)

|  |  |
| --- | --- |
|  | Nanomaterials (MDPI, Scopus, IF:5.3, Q1),Special Issue: |

*. Switzerland,* [*Multidisciplinary Digital Publishing Institute-MDPI*](https://www.scimagojr.com/journalsearch.php?q=Multidisciplinary%20Digital%20Publishing%20Institute%20(MDPI)&tip=pub)*)*

*.* [*Open Access*](https://www.mdpi.com/openaccess)*-free for readers, with*[*article processing charges (APC)*](https://www.mdpi.com/journal/applsci/apc)*paid by authors or their institutions.*

*. Indexed within*[*Scopus*](https://www.scopus.com/sourceid/21100829268?origin=sbrowse#tabs=0)*,*[*SCIE (Web of Science)*](https://mjl.clarivate.com/search-results?issn=2076-3417&hide_exact_match_fl=true&utm_source=mjl&utm_medium=share-by-link&utm_campaign=search-results-share-this-journal)*,*[*Inspec*](https://www.theiet.org/publishing/inspec/inspec-content-coverage/)*,*[*CAPlus / SciFinder*](https://sso.cas.org/as/authorization.oauth2?response_type=code&client_id=scifinder-n&redirect_uri=https%3A%2F%2Fscifinder-n.cas.org%2Fpa%2Foidc%2Fcb&state=eyJ6aXAiOiJERUYiLCJhbGciOiJkaXIiLCJlbmMiOiJBMTI4Q0JDLUhTMjU2Iiwia2lkIjoianMiLCJzdWZmaXgiOiJUYWozcGUu)*, and*[*other databases*](https://www.mdpi.com/journal/applsci/indexing)*.*

. ISSN:13475525, 13418939

*. IF: 5.3 (2022)& 5-Year Impact Factor: 5.4 (2022)*

*. JCR-Q1 (Physics, Applied)/CiteScore-Q1 (General Engineering).*

*.* [*Payment Instructions*](Payment%20Instructions)*: please see* [*https://www.mdpi.com/journal/nanomaterials/apc*](https://www.mdpi.com/journal/nanomaterials/apc)