



HAL
open science

Transfer and interface characterization of 2D materials for microelectronic devices

Paul Brunet, Kshipra Sharma, Julien David-Viffantzeff, Clotilde Ligaud,
Hanako Okuno, Simonas Krothus, Sergej Pasko, Xiaochen Wang, Ben Conran,
Lucie Le Van-Jodin

► **To cite this version:**

Paul Brunet, Kshipra Sharma, Julien David-Viffantzeff, Clotilde Ligaud, Hanako Okuno, et al.. Transfer and interface characterization of 2D materials for microelectronic devices. Graphene2022 - The 12th edition of Graphene Conference series, Jul 2022, Aachen, Germany. cea-03885866

HAL Id: cea-03885866

<https://cea.hal.science/cea-03885866>

Submitted on 6 Dec 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Transfer and interface characterization of 2D materials for microelectronic devices

Brunet Paul^[1], Sharma Kshipra^[2], David-Vifflantzeff Julien^[1], Ligaud Clotilde^[1], Okuno Hanako^[2], Krothus Simonas^[3], Pasko Sergej^[3], Wang Xiaochen^[4], Conran Ben^[4], Le Van-Jodin Lucie^[1]

^[1] CEA, LETI, MINATEC Campus, F-38054 Grenoble, France and Univ. Grenoble Alpes, F-38000 Grenoble, France

^[2] CEA, IRIG, MINATEC Campus, F-38054 Grenoble, France and Univ. Grenoble Alpes, F-38000 Grenoble, France

^[3] Aixtron SE, Dornkaulstr. 2, 52134 Herzogenrath, Germany

^[4] Aixtron LTD, Anderson Road Buckinghamway Business Park Swavesey Great Britain, Aixtron Ltd, UK

paul.brunet@cea.fr

Abstract: 2D materials have attracted a lot of attention since the last decade due to their unique properties especially in the microelectronics field [1]. However thermal budgets engaged for the synthesis of high quality 2D materials are, most of the time, not compatible for the direct growth into device structures. Therefore, transferring synthesized layers from the growth substrate to a desired one is required for functional device fabrication [2]. However, the transfer process could modify or degrade the material properties, and the quality of interface between the transferred materials and the targeted substrates should be carefully controlled to achieve the expected properties. [3]

Our work focuses on the development of a clean room compatible large-scale transfer process based on spalling method for its integration into microelectronic devices such as photonics, RF switches or memories.

We report here a physico-chemical characterization of 2D layers before and after transfer using microscope SEM and TEM, AFM, XPS and Raman spectroscopy to study the impact of our transfer process. The electrical properties are also studied using four probes and Van Der Pauw measurement after transfer to verify the electrical interface while optimizing the process to get a good copy of the as grown materials by keeping the growth interface safe from solvent or other impurities.

References

- [1] Wu, M, Xiao, Y, Zeng, Y, et al. *InfoMat*. 2021; 3: 362– 396
 - [2] Shim et al., *Science* 362, (2018) 665–670
 - [3] Yuan Liu, Xidong Duan, Hyeon-Jin Shin, Seongjun Park, Yu Huang & Xiangfeng Duan, *Nature* | Vol 591 | 4 March 2021
-

Figures

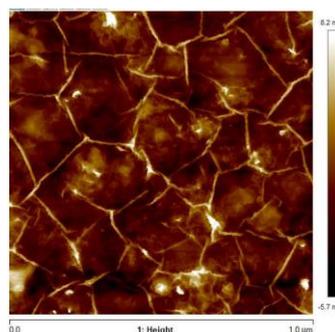


Figure 1: Atomic force microscopy of h-BN from Aixtron