
PhD position in 3D conformable Electronics

“From Passive to Active 3D Electronics Components: Fabrication and Characterizations”

Context:

On the one hand, futuristic concepts such as electronic skin, 3D displays, 3D photovoltaic panels are announced. On the other hand, conventional electronics requires the fabrication on rigid planar wafers that cannot fit the shape of a 3D object. This mismatch led to the development of a new concept: **3D electronics also known as conformable electronics**. The Organic And Silicon System team of IETR (Institute of Electronic and Telecommunications of RENNES, France; <https://www.ietr.fr/>) aims to take part of this fascinating topic promoting a disruptive technology (3 patents pending technologies) in comparison with the state of art.

To date, two major technologies have emerged to solve this challenge: stretchable and ultrathin flexible electronics.^[1-3] However, reported works do not deal with the following drawbacks: i) wrinkles and folds are inevitable when wrapping a 2D planar flexible sheets (i.e., the substrate) on complex 3D surfaces with two nonzero principal curvatures (e.g. a corner) or having a hole in it.^[4] ii) plastic electronics is not consistent with the aims of consumer to reduce electronic waste. Consequently, the aim of this project is the development of an original manufacturing process based on the patent pending technology called: Water Transfer Printing.^[4-7]

Silicon based technology will be used to fabricate passive devices (e.g., resistors, capacitors...) at first and in the second step active devices such as thin film transistors. The devices will be fabricated onto complex 3D morphologies (corner, concave convex...) and characterized (electrical, optical, etc.).



Candidate

The PhD candidate will work in a multidisciplinary research environment ([NanoRennes](#) facilities) where engineering and materials science have to be combined to improve the development of highly efficient and reliable 3D devices.

We are looking for a talented, curious, enthusiastic, and motivated life scientist for a three-year PhD position. As a PhD candidate, you are committed to conduct independent and original scientific research, to report on this research in international publications and conferences, and to assist in the supervision of research projects for both bachelor and master students.

Qualifications

Candidates should have a MSc degree with expertise/background in materials science and engineering. We would particularly welcome applications from candidates with background in engineering materials, chemical engineering, microelectronics and semiconductor devices.

The PhD candidate is expected to have an excellent academic record and should be able to work in a multidisciplinary environment in close cooperation with other experts. Excellent communication skills and good command of English (oral and written) are also required.

Information and Application

Questions regarding this position can be directed to: Dr. Maxime HARNONIS, email: maxime.harnois@univ-rennes1.fr and Pr. France LE BIHAN, email : france.le-bihan@univ-rennes1.fr

Applications, including a CV, a statement of your interest must be attached to your application form.

References

- [1] J. A. Rogers, T. Someya, Y. Huang, *Science* 2010, 327, 1603.
- [2] T. Someya, S. Bauer, M. Kaltenbrunner, *MRS Bull.* 2017, 42, 124.
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- [4] B. Le Borgne, O. De Sagazan, S. Crand, E. Jacques, M. Harnois, *ACS Appl. Mater. Interfaces* 2017, 9, 29424.
- [5] B. Le Borgne, S. Liu, X. Morvan, R. A. Sporea, N. Lu, M. Harnois, *Adv. Mater. Technol.* 2019, 1800600.
- [6] B. Le Borgne, E. Jacques, M. Harnois, *Micromachines* 2018, 9, 474.
- [7] M. Harnois, Himdi, M., Yong, W. Y., Rahim, S. K. A., Tekkouk, K., & Cheval, N. (2020). *Scientific reports*, 10(1), 1-8.