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### Résumé/Abstract:

## **Microsupercapacitors: when Technology meets Science**

Nowadays, miniaturized power sources are key devices for providing autonomy to smart and connected sensors. To reach this goal, the current trend is to fabricate micro-storage unit such as microbatteries (MB) or microsupercapacitors (MSC) at the wafer level. According to the limited surface of such device, the metrics should be reported as normalized to the footprint area (mF,  $\mu\text{Wh}$  and  $\text{mW per cm}^2$ ). With such metrics, the average energy density of most of MSC (Onions like carbon, graphene) is found to be close to  $1 \mu\text{Wh/cm}^2$  which is not enough to get autonomous miniaturized and connected sensors. Our approach aims at significantly improving the performances of MSC. One attractive way to improve the areal energy density of MSC is to enhance the material mass loading while keeping low the footprint area. To achieve this requirement, on chip fabrication of 3D MSC is proposed. Wafer level fabrication process on high area enlargement factor 3D scaffold (AEF # 50) is achieved. Step conformal deposition of  $\text{MnO}_2$  thin film (electrolytic deposition) on this 3D template is performed and the MSC are tested either in aqueous electrolyte (5M  $\text{LiNO}_3$ ) or in ionogels. The areal energy density of the proposed micro-device is close to  $10 \mu\text{Wh/cm}^2$  while maintaining surface power density of  $10 \text{mW/cm}^2$ . Alternatively, MSC based on vanadium nitride thin films grown either by sputtering technique (for planar MSC) or by atomic layer deposition technology (for 3D MSC) can be achieved.

This communication aims at providing practical information about MSC manufacturing as well as in-depth scientific investigations of charge storage mechanism.

**Bio:**

Thierry Brousse is a Distinguished Professor of Materials Science at the University of Nantes. He received his PhD degree in 1991 and joined the University of Nantes in 1994 where he got a Full Professor position in 2005. He is a researcher at Institut des Matériaux Jean Rouxel (IMN). His research focuses on materials for electrochemical energy storage with particular emphasis on innovative and/or modified materials for electrochemical capacitors and related devices/microdevices. He is Associate Editor for the Journal of The Electrochemical Society. He has mentored 25 PhD students. With his team as well as international collaborators, he co-authored 9 books' Chapters, 170 peer-reviewed journal publications, 9 patents, and 60 invited and keynote lectures at International meetings. He is vice-dean of the University of Nantes in charge of Innovation since 2013.