

4th International Conference on **Electrochemistry**

June 11-12, 2018 | Rome, Italy

Forest of structured nanowires for energy storage and production**Denis Buttard¹, Olivier Marconot², Dhruv Singhal¹, Michael Belluzzi¹, Othman Lagrichi¹, Arnaud Morin³, Olivier Bourgeois⁴ and Dimitri Tainoff⁴**¹Grenoble Alpes University - CEA, France²Sherbrooke University, Canada³CEA-Grenoble, France⁴Néel Institute - CNRS, France

The storage and production of electrical energy is a major issue of the 21st century. Many methods are developed today for embedded systems in the range of small storage. In this context, the development of nanoscale 3D structures makes it possible to considerably increase the specific area of the material. By working on this surface increase but also on its reactivity we can considerably increase the performances of the devices. We have developed in our laboratory electrochemical methods for the production of ultra-dense align nanowires and nanotubes embedded in nanoporous alumina membrane with various materials like metals (Cu, Au, Ni, Pt), semiconductors (Si, Ge) or dielectrics (TiO₂, polymers) for their integration into electrical devices in partnership with companies in link with industrial issue. We will present some of our results in various fields of electricity production such as PtCu and/or PtNi nanotubes fuel cells, Si nanowires solar cell and thermoelectric devices. We will also present their applications for electrical storage: 3D metal-insulator-metal capacitors, electrolytic capacitors, and supercapacitors. Electrochemical elaboration as well as electrochemical operation will be presented.

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