

PhD in Electric, Electronics and Communications Engineering

Research Title: Flexible and wearable supercapacitors

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Context of the research activity	<p>In very recent years, supercapacitors (SCs) have gained a considerable attention because of their ability to deliver higher power density than batteries and storing higher energy density than electrostatic capacitors. The behavior of such devices is strongly influenced by the architecture, the sealing and packaging technology, and, most dramatically, it is influenced by the active materials at the electrodes. For this reason, it is essential to develop new materials able to deliver high specific capacitance, high cycling stability and with a good rate capability. The emerging internet of things (IoT) technology will connect many untethered devices, e.g. sensors, RFIDs and wearable devices, to improve health lifestyle, automotive, smart buildings, etc. In particular SCs can easily answer to the power demand of wearable electronics thanks to their intrinsic advantage of safety and durability with respect to rechargeable batteries.</p>
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Objectives	<p>The main research objectives of this PhD thesis includes (not necessarily all): Innovative active materials - study and development of innovative carbon-based materials obtained by recycling of organic materials. Biocompatible electrolytes - investigation of exploitability of BIO-derived Ionic liquid.</p>
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	<p>Flexible architecture wire-shaped and flexible assembly will be investigated to allow easy integration of SCs within textile.</p> <p>Energy harvesting&storage integration the fabrication of hybrid device able to harvest and directly store energy will allow the fabrication of portable self-rechargeable power-pack</p>
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<p>Skills and competencies for the development of the activity</p>	<p>Candidates should have a solid engineering background and strong motivation to learn through advanced research.</p> <p>Expertise in materials science, nanomaterials, electrochemistry, advanced processes and technologies is preferred.</p> <p>Problem solving ability and practical experience for laboratory activity is also required.</p>
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