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**Invited talk. Novel materials and fabrication techniques for wearable energy generation and storage devices - from piezoelectric fibers to li-ion threads**

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The R&D of novel nano-materials and fabrication techniques for wearable energy generation and storage devices has received considerable attention due to the fast-growing market of wearable personal electronics. In this presentation, we will talk about some of those exciting materials and fabrication techniques targeting specific applications of wearable energy generation/storage and sensing using piezoelectric fibers, Li-ion battery threads (stripes), and capacitor fibers.

**Piezoelectric fibers**. First, we will review the piezoelectric materials and existing techniques for the fabrication of piezoelectric fibers. Then, we will concentrate on the fiber drawing technique as this technique offers many advantages over alternative methods such as ability to produce complicated microstructures of the fiber with improved piezoelectric functionalities, increase active-area for piezoelectric generation, integrate and on-fiber electrodes for easy connectorization. Using fiber drawing technique, we report fabrication and characterization of the piezoelectric PVDF-BTO fibers, PVDF-CNT fibers as well as PVDF-PZT fibers. We also demonstrate several applications of such fibers in automotive, aerospace and wearable electronics.
**Li-ion battery threads (stripes)**. Second, we will review some of the materials and techniques for the fabrication of flexible Li-ion battery threads (stripes) for compliant energy generation and storage. As a typical example of the Li-ion battery thread, we will talk about LFP-LTO material combination, layer by layer deposition technique and final assembly and encapsulation techniques. Electrochemical characterization and potential applications of such batteries will be then presented.
**Capacitor fibers**. Finally, we will talk about fabrication of the capacitor fibers using fiber drawing technique. Materials, fabrication technique and electric characterization of the capacitor fibers will be detailed. Application of such fibers in tactile sensing will be presented.

In summary, we will give a talk on wearable energy generation/storage and sensing devices. A large number of demonstrators using our piezoelectric fibers, battery threads, and capacitor fibers will be discussed. We believe that the materials and techniques presented in this talk could draw extensive interest in the academic community.

References:

1. X. Lu, H. Qu, and M. Skorobogatiy, "Piezoelectric Micro- and Nanostructured Fibers Fabricated from Thermoplastic Nanocomposites Using a Fiber Drawing Technique: Comparative Study and Potential Applications," ACS Nano, DOI: 10.1021/acsnano.6b08290, (2017)
2. H. Qu, J. Hou, Y. Tang, O. Semenikihin, and M. Skorobogatiy, "Thin Flexible Lithium Ion Battery Featuring Graphite Paper Based Current Collectors with Enhanced Conductivity," Canadian Journal of Chemistry, vol. 95, pp. 169-173, dx.doi.org/10.1139/cjc-2015-0593, (2017)
3. **Invited Review Paper:** A.K. Yetisen, H. Qu, A. Manbachi, H. Butt, M.R. Dokmeci, J.P. Hinestroza, M. Skorobogatiy, A. Khademhosseini, and S.H. Yun, "Nanotechnology in Textiles," ACS Nano, DOI: 10.1021/acsnano.5b08176, Feb. 2016.
4. **Book Chapter (Ch. 4):** H. Qu, M. Skorobogatiy, "Conductive polymer yarns for electronic textiles," in Electronic textiles: Smart fabrics and wearable technology ed. Tilak Dias, (Woodhead Publishing, to appear in 2014)
5. **Book Chapter (Ch. 6):** S. Gorgutsa, M. Skorobogatiy, "Tactile sensing textiles using soft capacitance fibers," in Multi-disciplinary know-how for smart textile developers ed. Tünde Kirstein, (Woodhead Publishing 2013

**Presentation Method (Poster/ Invited Oral 15/20/25/30minutes): Invited Oral 25 minutes**