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Topic of the Speech:
Wearable and Implantable Piezoelectric Materials for Biomechanical Energy Harvesting and Utilization

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Professor Xudong Wang is the Grainger Institute for Engineering Professor in the department of Materials Science and Engineering at University of Wisconsin – Madison, and the Energy & Sustainability thrust Leader at the Grainger Institute for Engineering. Dr. Wang received his PhD degree in Materials Science and Engineering from Georgia Tech in 2005.

His current research interests include developing advanced nanomaterials and nanodevices for mechanical energy harvesting from human activities for biomedical applications; and understanding the coupling effect between piezoelectric polarization and semiconductor functionalities.

He has won number of prestigious national and international awards, including PECASE, NSF CAREER Award, DARPA Young Faculty Award, etc. He has published more than 170 papers on peer-reviewed journals, including Science, Nature, Nature Energy, etc. His current h-index is 75.

ABSTRACT SUBMISSION
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Wearable and Implantable Piezoelectric Materials for Biomechanical Energy Harvesting and Utilization

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ABSTRACT (NO MORE THAN 500 WORDS:)

Nanogenerator (NG) has been considered as a promising solution to biomechanical energy harvesting inside human body. So far, many technology innovations have advanced the NG technology toward a broad range of biomedical applications. Fundamentally, materials design and engineering draw the boundary where this technology may advance. For the application of wearable and implantable devices, the materials and devices need to be flexible, stretchable (with at least the same modulus as the body tissue) as well as carrying the desire functionality. In this talk, I will introduce our most recent development of flexible piezoelectric materials that are particularly designed for implantable NG applications. First, I will present our wafer-scale approach to creating piezoelectric biomaterial thin films based on γ glycine crystals. The self-assembled sandwich film structure enabled both strong piezoelectricity and largely improved flexibility. Then, new ferroelectric composites will be presented as a new material used in 3D printing for directly manufacturing of piezoelectric architectures with tunable piezoelectric and mechanical properties. Advanced electrosipinning approaches will also be introduced to produce piezoelectric fibers that can be used to make flexible piezoelectric mats for biomechanical energy harvesting and sensing. Toward the end, novel applications of implantable piezoelectric materials are introduced, which enable new concept of the closed-loop electrostimulations for many biomedical therapeutics.