EuroSciCon

World Congress on

Materials Science & Engineering

August 23-25, 2018
Amsterdam, Netherlands

Tsvetanka S Zheleva et al., Nano Res Appl 2018, Volume: 4
DOI: 10.21767/2471-9838-C4-017

ELECTRONIC MATERIALS RESEARCH FOR ENERGY AND POWER APPLICATIONS

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The demand for very high or extremely low power consumption, improved performance, and reduced cost, size, and weight, motivate the electronic materials research focus of the Energy and Power (E&P) programs at the US Army Research Laboratory (ARL). A brief overview of our programs on electronic materials will be provided. This includes growth, processing, characterization and fabrication of materials and devices, including modeling and simulation of materials characteristics and devices operation. Much of our efforts are on efficient energy conversion materials, including materials and devices for photovoltaics, thermophotovoltaics, betavoltaics, thermoelectrics, pyroelectrics and others. Examples from our programs on high power and low power electronics will be discussed in more detail. One aspect of our high power, high temperature electronics program includes research on wide bandgap materials and devices: correlation of structural, analytical and electrical characteristics of SiC MOS device structures. On the other side of the spectrum, the low power, low loss, energy efficient electronics, a new class of materials are emerging, quantum materials and the corresponding devices enabling unique electronic properties and functionalities. An example of our program on quantum materials includes PbSnTe-based topological insulators, including materials growth, processing and characterization of the topological device structures. Much of our research is performed in close collaboration with our partners from the open campus and the ARL extended capabilities. A brief summary of the various collaborative opportunities with ARL will be presented at the end.

Biography

Tsvetanka S Zheleva is the Associate Chief for the Energy and Power Division at ARL. Her expertise is in the areas of Applied Physics and Materials Science. She has published her research in over 150 publications in the areas of thin film physics, semiconductor materials and devices, interface engineering, structural analysis of device heterostructures. She holds 12 patents and her work is cited over 4000 times in peer reviewed journals and patent literature.

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