Stretchable electronics based on one-dimensional nanomaterials

Zhu, Yong, yong_zhu@ncsu.edu; Yao, Shanshan; Myers, Amanda; Cui, Zheng, North Carolina State University, United States

ABSTRACT

We recently developed stretchable electronic devices using several types of one-dimensional (1D) nanostructures such as silicon nanowires (SiNWs), AgNWs, and carbon nanotubes (CNTs). Several advantages of 1D nanostructures for such applications include: (i) the 1D nanostructures possess excellent electric and mechanical properties, such as high mobility and large fracture strength; (ii) they can be tailored into different buckling shapes, either individually or collectively. For example, individual SiNW were found to buckle into coiled shape, which exhibited superior stretchability (e.g., over 100% strain); CNTs and AgNWs buckled collectively either out-of-plane or in-plane. In this discussion, we will discuss several device applications based on the 1D nanostructures, including strain sensors, pressure sensors, tactile sensors, antennas, and wearable electrodes for bioelectric measurements.