MICROSYSTEMS FOR THERMAL ENERGY POWERING

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Flexible thermoelectric micro power generators have been developed for wearable devices such as body area network. Also in order to store the generated power, a micro solid state supercapacitor using thin films composed of graphene nanowall are developed. The flexible thermoelectric micro power generator is fabricated by electrochemical deposition of Bi_2Te_3 and Sb_2Te_3, which is embedded by PDMS, as shown in Fig. 1. A power generation of 4 $\mu W/cm^2$ are demonstrated from human body temperature. In order to improve the power generation performance, nanocomposites of Bi_2Te_3 and Au nanoparticles are synthesized by co-electrodeposition (Fig. 2). For the fabrication of the solid state micro super capacitor, plasma-enhanced chemical vapor deposition is used to deposit graphene nanowall on a spiral-shaped silicon electrode pattern (Fig. 3). On the graphene nanowall Ru oxide or Ni oxide is deposited for charge storage layer. Areal energy density of ~15 $\mu Wh/cm^2$ and areal power density of ~2.49 mW/cm^2 are achieved. Also a wide operation voltage range will allow to the application to energy storage of the thermoelectric power generator.

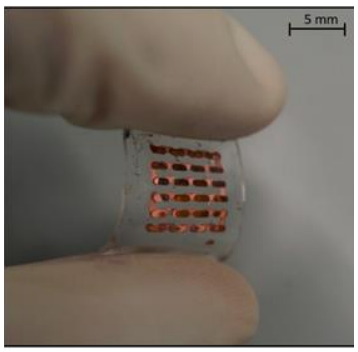

Figure 1. Developed Flexible power generator based on electroplated Bi_2Te_3-Sb_2Te_3.

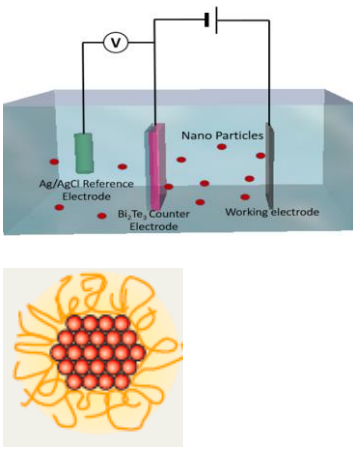

Figure 2. Metal Nanoparticle inclusion method using co-electrodeposition.

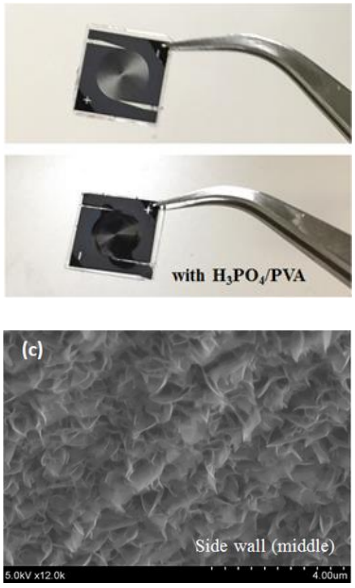

Figure 3. Carbon nanowall based solid state micro-supercapacitor