

“Bottom-Up Silicon Nanowire Arrays for Thermoelectric Harvesting”

C. Calaza, M. Salleras, D. Dávila, A. Tarancón, A. Morata, J.D. Santos, G. Gadea, L. Fonseca

12th European Conference on Thermoelectrics, Madrid (Spain), 24-26 Sept 2014

Materials Today: Proceedings 2 (2015) 675 – 679 doi: 10.1016/J.Matpr.2015.05.085 – Open Access

Abstract

Ordered dense arrays of p-type Si nanowires produced with a VLS method have been surveyed as a new active material to produce all-Si thermoelectric energy harvesters. The thermoelectric properties of the meta-material consisting of bundles of thousands of 10 μ m long Si nanowires (with a mean diameter of 100 nm) were measured making use of an integrated self-test element (heater/thermometer) that allows an accurate control of the temperature gradient in the silicon micromachined structure used to assemble the thermocouples. The measured Seebeck coefficient S and thermal conductivity k together with the resistivity reported in literature for similar boron doped Si nanowires suggest a ZT figure of merit at ambient temperature between 0.30 and 0.93, showing that proposed nanowire arrays can be a promising candidate for enhancing Si thermoelectric properties.