

International Conference on

NANOTECHNOLOGY AND NANOENGINEERING

July 16-18, 2018 | Paris, France



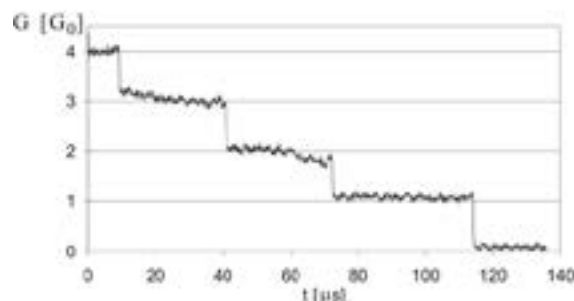
Waldemar Nawrocki

Poznan University of Technology, Poland

Electrical resistance of metallic and semiconductor nanowires

In the paper electrical resistance (conductance) and thermal conductance of metallic and semiconductor nanowires are discussed. We have analyzed and measured nanowires created of gold, copper, tin, silicon and germanium because of using them for manufacturing of integrated electronic devices. Electrical conductance G_E and thermal conductance G_T of a nanostructure describe the effect of electron transport in nanowires. Electrical conductance quantization in nanowires has been observed in units of $G_0 = 2e^2/h = (12.9 \text{ k}\Omega)^{-1}$ up to five quanta of conductance according to the theory proposed by Landauer [1]. In the paper we present our measurements of electrical conductance quantization in Au nanowires at room temperature [2]. The quantization of thermal conductance is considered in a similar way like the electrical conductance. In one-dimension systems are formed conductive channels. Each channel contributes to a total thermal conductance with the quantum of thermal

conductance G_0 . Quantized thermal conductance and its quantum (unit) G_0 was confirmed by Schwab [3]. The quantum of thermal conductance $G_{T0} [\text{W/K}] = (\pi_2 k_B^2/3h)T = 9.5 \times 10^{-13} T$ depends on the temperature. At $T = 300 \text{ K}$ value of $G_0 = 2.8 \times 10^{-10} [\text{W/K}]$. This value is determined for an ideal ballistic transport in a nanowire



Biography

Waldemar Nawrocki is Professor of electronics at Poznan University of Technology, Poland, where he earned a Ph.D. in technical sciences in 1981. Dr. Nawrocki also holds a D.Sc. in physics from Jena University, Germany, in 1990. His research fields are: Applications of quantum effects in metrology, Quantization of conductance in mesoscopic systems, Noise thermometry, Cryoelectronics, Measurement systems. Dr. Nawrocki has published 14 books, e.g. Measurement Systems and Sensors (Artech House, 1st edition – 2005, and 2nd edition - 2016) and Introduction to Quantum Metrology (Springer, 2015). Over the period 2006 to 2016 he organized and chaired five international conferences on quantum metrology.

waldemar.nawrocki@put.poznan.pl

Notes: