Abstract

Thermal failure accounts for over 50% of overall failures of the electronic components. To prevent thermal failures, effective heat spreading from endangered elements is required. In this process, thermal interface materials play key role by assuring appropriate contact area between subsequent elements in heat spreading system.

In presented dissertation a new, competitive thermal interface composite has been developed. Its exemplary application and preliminary investigation of its effectiveness in this application was carried out. The one specific composite has been chosen among a number of composites developed and investigated in presented dissertation. Chosen composite consists of silicone rubber (RTV-2) as matrix and silver nano-/micro- fraction (**nAgtoSF**) constituting 50%wt of entire structure as an active substance. Listed components are provided by the industrial partner as products that do not constitute an additional financial burden for him or as post-production waste. The **nAgtoSF** 50% was solely manufactured with usage of industrial partner infrastructure. Crucial physical properties for chosen composite were measured and following values were obtained: his dynamic coefficient of viscosity (19,21 Pa*s), Young modulus (4,952 MPa), specific heat (1113 j/kgK), thermal diffusivity ($1{,}51*10^{-7}$ m^2/s), resistivity ($6{,}2*10^{-8}$ Ωm), thermal conductivity (0,26 W/mK) and thermal contact resistance in the operation of the contact (0,008 m^2K/W). Its resistance to elevated (+100°C) and lowered (- 40°C) temperatures impact was determined.

The use of composite in the construction and improvement of thermoelectric modules was indicated as an example application. After application of **nAgtoSF** 50% composite almost 130% growth of voltage generated by the module was observed.

Key words: nanoparticles, Graphene, silver, Thermally conductive materials, thermal conductivity, thermal conductivity, aging tests, recycling of nano- and microparticles.