

Thermoelectric Properties of Doped Polycrystalline Silicon Film

Authors : Li Long, Thomas Ortlepp

Abstract : The transport properties of carriers in polycrystalline silicon film affect the performance of polycrystalline silicon-based devices. They depend strongly on the grain structure, grain boundary trap properties and doping concentration, which in turn are determined by the film deposition and processing conditions. Based on the properties of charge carriers, phonons, grain boundaries and their interactions, the thermoelectric properties of polycrystalline silicon are analyzed with the relaxation time approximation of the Boltzmann transport equation. With this approach, thermal conductivity, electrical conductivity and Seebeck coefficient as a function of grain size, trap properties and doping concentration can be determined. Experiment on heavily doped polycrystalline silicon is carried out and measurement results are compared with the model.

Keywords : conductivity, polycrystalline silicon, relaxation time approximation, Seebeck coefficient, thermoelectric property

Conference Title : ICTFFM 2023 : International Conference on Thin Films and Functional Materials

Conference Location : Paris, France

Conference Dates : July 10-11, 2023