When generation. in the determination of the thermoelectric

When we are discussing thethermoelectric generator, we need to take into account the application of the Seebeckeffect to the electrical generation. In the determination of the thermoelectricperformance, we only consider the heat transfer occurs between the twobranches, excluding the heat transfer by radiation. The efficiency of thethermoelectric generator is given by the ratio between electrical energyprovided to the load and the total heat flow from the hot junction 16.

The equation can bewritten as: (5) Theperformance of the thermoelectric material, the p-type and n-typesemiconductor, can be expressed by a dimensionless figure of merit or ZT, withthe equation: (6) Where? is the Seebeck coefficient of the material, ? is the electrical resistivityof the material, ? is the thermal conductivity of the material, and T is theworking temperature. We call the value of ? 2/? as the power factor. The relation between efficiency and the figure of merit can be written by thefollowing equation: (7) When we are discussingabout power generation that has thermal process in the system, the maximumefficiency will have the value of Carnot cycle, which is equal to the firstpart of the equation.

The second part of the equation shows the relationbetween efficiency and ZT, where the higher ZT leads the efficiency closertowards the efficiency of the Carnot cycle 3. In the determination of thetotal efficiency, it is also important to include geometric parameters such aslength and area which is excluded from the equation 3, 16-19. Fromthe equation of the ZT above, we can see that it is related to severalparameters. It is important in the research of thermoelectric to find thesuitable material because some of the parameters mentioned before has an inverserelationship with the other,

when one parameter goes up, the other goes down. In the figure below we can see the relation of those parameters with the carrierconcentration of the materials: