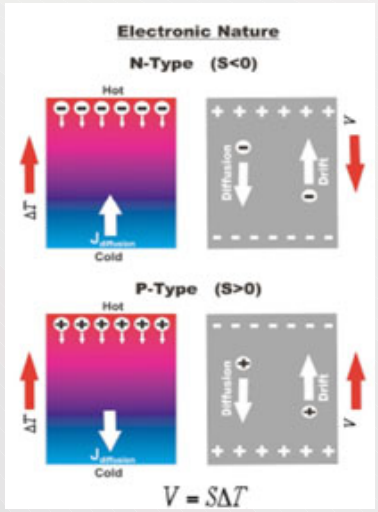
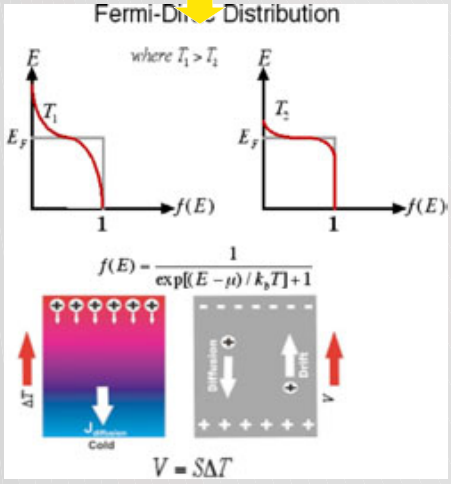
Sicherheit in der Fügetechnik Fachgruppe V.5

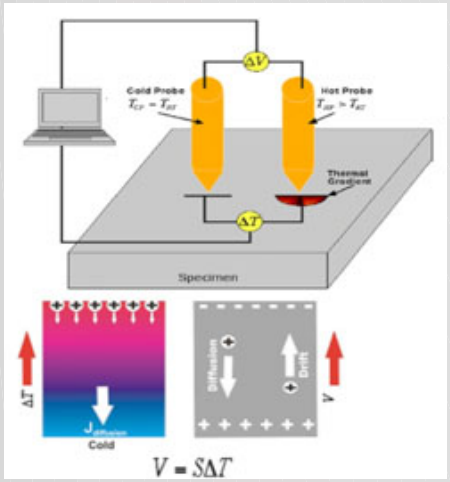
Thermoelectric Diagnostics for Non-Destructive Evaluation

FederalInstitute for Materials Research and Testing, V.5 Joining Technology Colorado School of Mines, Center for Welding, Joining, and Coatings Research

Thermoelectric power is defined as an open circuit electric field created by an induced temperature gradient. An applied temperature gradient results in:
An increase in kinetic energy of the electron gas
Promotion of carrier (electrons or holes) migration from high energy states to low energy states (hot to cold) resulting in a thermoelectric field
A measurable change in the Fermi level







$$V_{ab} = \int_{T_1}^{T_2} S_{ab}\,dT \qquad S_a = \frac{\Delta V}{\Delta T} + S_b$$

Thermoelectric power (presented by Seebeck Coefficient S) is a function of:

Carrier (Electron) Scattering, *r*Carrier (Electron) Concentration, *n*Effective Mass, *m*

*Which are affected by the:

Solute Content
Lattice Strain
Microstructural Changes
Material Processing
Time-Dependent
Phase Changes

$$\text{High Carrier Concentration}: \frac{E_F - E_o}{kT} \geq 5$$

$$S = \pm\frac{k}{e}(27.1)\left(r + \frac{3}{2}\right)\left(\frac{m^*}{h^2}\right)kTn^{-2/3}$$

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