

Thermodynamic processes [tln79]

The study of equilibrium thermodynamics cannot do without processes that connect equilibrium states. Processes necessarily disturb the equilibrium.

Generic process:

- During a generic process between equilibrium states some of the thermodynamic variables may not be defined.
- Information about changes in all thermodynamic variables during a generic process can be obtained if we connect the same initial and final equilibrium states by a quasi-static process.

Quasi-static process:

- A quasi-static process involves infinitesimal steps between equilibrium states along a definite path in the space of state variables.
- The equations of state remain satisfied as the thermodynamic variables change during a quasi-static process.

Adiabatic process:

- During an adiabatic process the system is thermally isolated. There is no heat transfer. Changes are caused by work performance.
- An adiabatic process must not be too fast in order not to produce entropy within the system.
- In some practical applications, an adiabatic process must not be too slow in order to prevent significant heat exchange between the system and the environment.

Reversible and irreversible processes:

- In an isolated system the entropy (to be defined) stays constant during a reversible process and increases during an irreversible process.
- Quasi-static processes can be reversible or irreversible.