STAGES OF DEVELOPMENT BASED CONCEPT OF ENTROPY EQUILIBRIUM THERMODYNAMICS

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An analysis of the concept of entropy - from phenomenological to statistical representation.

Entropy, equilibrium processes, reversibility, minimum entropy production, Gibbs energy, statistical thermodynamics.

Real progress is uneven, the evolution of an arbitrary state to a state of balance is a result of irreversible processes.

Two or more vzaimosuschestvuyuschie and exchanging energy or matter (or energy and material) of the system, eventually reaching the state of thermal equilibrium in which the systems become the same temperature. And so the equilibrium of the system is characterized by the equilibrium temperature distribution, and for them there are functions of state - the energy and entropy.

The purpose of research - to expand the concept of entropy and significance on the basis of modern thermodynamics.

Materials and methods of research. In 1865, German physicist R. Clausius introduced the concept of entropy, which depends only on the initial and final states of a reversible process.

Undoubtedly, the statement that the entropy production in every part of the system caused by an irreversible process - a positive value, is more stringent than the classical formulation of the second law (entropy of an isolated system can only increase or remain unchanged). Note that the second law of thermodynamics, formulated in such a formulation does not require the system to be isolated. This is true for all systems independently of the boundary conditions.

For irreversible processes that can be studied experimentally, nonequilibrium thermodynamics is based on an explicit expression for σ. Before displaying this expression, we write the explicit equation of balance of local power and local concentrations.

Minimum entropy production

In a thermodynamic system different forces Fk (k = 1,2, ..., n) correspond to different streams Ik. The system may be far from equilibrium, keeping some forces Fk (k = 1,2, ..., s) at fixed non-zero values, and leaving the rest of the forces Fk (k = s + 1, ..., n) be free. In this case, streams suitable withheld forces reaches a constant value (Ik = const, where k = 1,2, ..., s), while the force available to cause respective streams zero Ik = 0 (k = s + 1 , ..., n).

In the linear regime, the total entropy production systems for the flow of energy and matter (where σ - entropy generation) in the equilibrium state reaches a minimum value. This provision, the so-called "principle of least dissipation of entropy", was proposed by Rayleigh [3].

Gibbs free energy and chemical potential

Great contribution to the thermodynamics of chemical processes introduced by J.. W. Gibbs. He considered heterogeneous systems consisting of several homogeneous parts, each of which contained a substance S1, S2, ..., Sn with masses m1, m2, ..., mn.

Above it was a homogeneous systems. Thermodynamic dependence can be formulated using entropy sT (x), mk (x), which is a function of temperature and density the number of moles.

Since the whole system is not in thermodynamic equilibrium, full entropy S is generally not a function of total energy U and the total volume V. However, the thermodynamic description remains possible if the temperature is well defined at each point in space.

Conclusion

Entropy is a measure of the energy loss (irreversibility) phenomena taking place in many areas of production: heat and mass transfer, the physico-chemical, disperse structures, fluctuations etc. In the future, with the advent of new technical solutions entropy, no doubt, will play the role of valuation measure of excellence in relation to the energy of the investigated phenomena.