Drying processes are: contact drying with heating the material through the wall; drying with heated gas or air; drying with high frequency currents; infrared radiation drying.

Thermodynamics. *The heat effect of the reaction*

A change in the chemical composition of the reacting mixture leads to a change in its heat content ΔH_T, which can be calculated in terms of the enthalpy of formation of the components:

$$\Delta H_T = \Sigma v_i (\Delta H_T)_{formation \cdot i.}$$

If the enthalpy of formation of products is less than the enthalpy of formation of the starting materials, $(\Delta H_T < 0)$, then the heat $Q_p = -\Delta H_T$, called *the heat of reaction*, is released. If during the chemical transformation the heat content of the mixture increases $(\Delta H_T > 0)$, then heat is absorbed.

Depending on the sign of ΔH (or Q_p), the reactions are *exothermic* ($\Delta H < 0$, $Q_p > 0$) and *endothermic* ($\Delta H > 0$, $Q_p < 0$).

The heat effect of the reaction enters the thermochemical equation, which is a stoichiometric equation indicating its thermal result:

$$v_A A + v_B B + ... - v_R R + v_s S + ... + Q_p$$

The heat effect of the reaction is necessary to determine the thermal phenomena in the process. The amount of heat released or absorbed q_p depends on the amount of converted substance ΔN during the process:

$$q_p = Q_p \cdot \Delta N_A / v_A.$$

The sign Q_p indicates whether during the course of the process heat is released or absorbed.

A chemical process is possible if the reaction proceeds with a decrease in the chemical potential, called the isobaric potential or *Gibbs energy* (*G*). The possibility of the reaction is determined by the following conditions:

when $\Delta G_{T,P} < 0$, the reaction is possible;
when $\Delta G_{T,P} > 0$, the reaction is impossible;
when $\Delta G_{T,P} = 0$, the system is in thermodynamic equilibrium.

$\Delta G_{T,P}$ is the change in *Gibbs energy* during the transformation of the initial substances into products at temperature *T* and pressure *P*.

The change in *Gibbs energy* in the reaction can be calculated by the equation:

$$\Delta G^{\circ}_{298} = \Sigma_i v_i (\Delta G^o_{298})_{formation \cdot i.}$$

The values of standard Gibbs energy for the formation of substances at standard temperature 298 K and pressure P=1 atm $(\Delta G^{\circ}_{298})_{formation \cdot i}$ are given in the reference literature on thermodynamics and mean the change in Gibbs energy when converting such a quantity of substance in the standard state, which is written in the stoichiometric equation.

Example: there is an infinitely large amount of mixture containing H_2, N_2 and NH_3 at a temperature *T=298 K* and a pressure $P_{H2} = P_{N2} = P_{NH3} = 1$ *atm*. If 1 mole of N_2 and 3 mole of H_2 turn into this mixture (this will not affect the composition of an infinitely large amount of the mixture), then the change in *Gibbs energy* will obey the given equation.

For the calculation in conditions different from the standard, use the dependence of Gibbs energy on temperature:

$$\Delta G_{T,P} = \Delta H_T^0 - T\Delta S,$$