Answer on Question #50362, Chemistry, Other

Task:

For the reaction:

2 NO (G) + O_2 (G) → 2 NO_2 (G)

a) Write the equilibrium constant expression for the reaction.

b) What effect would an increase in temperature have on the reaction rate?

c) What would be the effect on the reaction rate if the [O_2] were doubled?

d) What would be the effect on the reaction rate if the pressure on the reaction were doubled? Assume the reaction is reversible and at equilibrium.

e) What shifts in the equilibrium of this reaction are suggested by Le Chatelier's Principle?

f) IF AT EQUILIBRIUM THE

[NO_2] = 0.400 M

[O_2] = 0.875 M

AND THE KEQ OF THE EQUILIBRIUM IS 65

[NO] = ?

g) IF AT EQUILIBRIUM THE

[NO_2] = 0.400 M

[O_2] = 0.875 M

[NO] = 0.125 M

Keq = ?

Answer:

a) Equilibrium constant expression for the reaction:

$$K_{eq} = \frac{[NO_2]^2}{[NO]^2 \cdot [O_2]}$$

b) The enthalpy of this reaction is ΔH = -112 kJ. This means, that the reaction is exotermic. That is why, according to the Le Chatelier's Principle, an increase in temperature will stimulate the reverce reaction.

c) According to the equilibrium constant expression, if the [O_2] will be doubled, the rate of the reaction will decrese in 2 times.

d) According to the Le Chatelier's Principle, if the pressure on the reaction will be doubled, the reaction will shift to the rigth side. That is why the straigth reaction will be dominant.

e) According to the Le Chatelier's Principle, the changes in temperature, pressure and components concentrations can lead to the shifts in the equilibrium of this reaction (either to the side of straith or reverce reaction).

f) $$[NO] = \sqrt{\frac{[NO_2]^2}{K_{eq} \cdot [O_2]}} = \sqrt{\frac{0.4^2}{65 \cdot 0.875}} = 0.05\,M$$

g) $$K_{eq} = \frac{[NO_2]^2}{[NO]^2 \cdot [O_2]} = \frac{0.4^2}{0.125^2 \cdot 0.875} = 11.7$$