

Gas Phase Equilibrium

Data Table

Effect of Temperature and Pressure on the NO_2 - N_2O_4 Equilibrium	
Room temperature	
Color of gas at room temperature	
Temperature of hot-water bath	
Color of gas in hot-water bath	
Temperature of ice-water bath	
Color of gas in ice-water bath	
Observations upon further heating and cooling	
Color of gas when volume was initially reduced	
Final color of gas after volume was reduced	

Post-Lab Questions

- Write the chemical equation for the reaction of NO_2 to form the dimer N_2O_4 . Include the color of each compound underneath its formula.

- What color change was observed when the gas was cooled? In what direction did the equilibrium shift?

- What color change was observed when the gas was heated? In what direction did the equilibrium shift?

4. Are both reactant and product gases present in the original equilibrium mixture at room temperature? Explain.

5. Use the results of the heating and cooling experiments to decide whether the dimerization reaction of NO_2 is endothermic or exothermic. Rewrite the chemical equation for the reaction to include the heat term on the reactant or product side, as needed.

6. Use LeChâtelier's Principle to explain the effect of temperature on the gas phase equilibrium involving NO_2 and N_2O_4 .

7. Write the equilibrium constant expression (mass action expression) for the nitrogen oxide equilibrium. Does the value of the equilibrium constant depend on temperature?

8. According to Boyle's Law, what happened to the pressure inside the bulb when the bulb was squeezed to half its original volume? Use LeChâtelier's Principle to predict how this pressure change should affect the position of equilibrium for the NO_2 - N_2O_4 reaction.

9. Discuss the color changes observed when the gas volume was reduced. Do the changes agree with the prediction made above for the effect of pressure?

10. What other factors or conditions might have influenced the color changes observed when the bulb was squeezed? *Hint:* Did any of the other gas variables (P, V, T, n) change?