AFCoKaRE Practice Problem 7.3 Solution

*Purpose:* This problem allows you to practice using the Bodenstein steady state approximation to eliminate concentrations or partial pressures of reactive intermediates from rate expressions for non-elementary reactions.

*Problem Statement:* Reaction (1) is non-elementary; it has been proposed to occur via the mechanism consisting of reactions (2) through (5). Generate a rate expression for the non-elementary reaction (1) assuming mechanistic steps (3) and (4) to be effectively irreversible.

1. \( 2 \text{N}_2\text{O}_5 \rightleftharpoons 2 \text{N}_2\text{O}_4 + \text{O}_2 \) (1)
2. \( \text{N}_2\text{O}_5 \rightleftharpoons \text{NO}_2 + \text{NO}_3 \) (2)
3. \( \text{NO}_2 + \text{NO}_3 \rightarrow \text{NO}_2 + \text{O}_2 + \text{NO} \) (3)
4. \( \text{NO} + \text{N}_2\text{O}_5 \rightarrow 3 \text{NO}_2 \) (4)
5. \( 2 \text{NO}_2 \rightleftharpoons \text{N}_2\text{O}_4 \) (5)