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Oligooscillation in a closed system without autocatalysis

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Oscillatory chemical reactions are commonly associated with autocatalysis, where a product acelerates its own formation. This study presents a novel type of oscillation – termed *oligooscillation* – that occurs in a closed system without autocatalysis. The research focuses on a two-step consecutive reaction mechanism in which the second step is reversible, and an additional output reaction is included.

Through analytical modeling, we demonstrate that the concentration of a key reactant exhibits two maxima and one minimum over time, indicating oligooscillatory behavior despite the absence of autocatalysis. The findings suggest that oligooscillation emerges from the dynamic interplay between reaction rates and intermediate accumulation rather than self-catalyzing processes. This model introduces a new perspective on chemical kinetics in closed systems and provides insights into reaction mechanisms where oscillatory behavior can arise under previously unconsidered conditions. These results could have implications for understanding complex chemical and biochemical systems where oscillatory behavior is observed without an evident autocatalytic pathway.

Keywords: oligooscillation, general solution

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