Review of: "Reaction rate view on autocatalysis"

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Potential competing interests: The author declared that no potential competing interests exist.

The work is interesting and it deserves attention. However, there are some aspects that, in my opinion, need to be clarified.

1) According the current literature (see, for instance, T. Wilhelm and P. Hanggi,*J. of Chemical Physics*, Vol. **110,** N. 13 (1999)), reaction networks with mass-action kinetics where one reaction can be written as

$$S + \sum_i v_i^+ X_i -> P + \sum_i v_i^- X_i$$

The reaction velocity is assumed to be proportional to the concentrations of the involved reactants (in consideration of their molecularity). Here, S and P denote the sum of the constant substances and product. Xi is the ith variable reactant and v_i^+ and v_i^- its stoichiometric coefficients. In this case a simple unambiguous definition for an autocatalytic reaction can be given. The considered reaction is autocatalytic, if

$$v_i^+ \neq 0, v_i^- \neq 0 \text{ and } v_i^+ \neq v_i^-$$

for at least one , reactant X_i. For instance, the scheme of reactions

A→X,

2Y → Z,

X+Z→ Y+Z,

Y→ B

with A and B denoting constant reactants, does not contain an autocatalytic reaction.

The author is asked to show that the values reported in Table 1 verify the above conditions.

2) The author investigated the existence and nature of stationary states for the reaction scheme (1) - (3), as a function of the values reported in table 1 (for a give average values of assuming A and B and the product C)?

3) Today much attention is devoted to the stochastic theory of chemical reactions. For instance, it can be shown the the stationary distribution of X that appears in the intermediate in the chain of reactions

A+M->X+M

2X -> E+D

is no more given by the Poisson distribution. So, the macroscopic chemical equations have generally to be corrected by terms associated with deviations from the Poissonian.

Another meaningful example is provided by the Schlögl reaction

A+2X -> 3X

X->B

This chain exhibits a non equilibrium phase transition quite similar to that described by the classical Van der Waals equation. Near the critical point as well as near the coexistence curve the law of large numbers as expressed by the Schlögl model breaks down, as becomes proportional to a higher power of the volume. As in the case of equilibrium phase transitions, this breakdown can be expressed in terms of critical indices.

Does the author intend to investigate in the future also the stochastic aspect of the chain of reactions (1) - (3)?

Conclusions

The work is interesting and, in my opinion, deserves to be published. However, I encourage the author to take into account the suggestions expressed above. This will attract the reader's interest more.