

# Review of: "Reaction rate view on autocatalysis"

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The author insists on referring to the results presents in ref. 4 and states, that "no rates are addressed in it". However, the rates are considered in that paper; values of the reaction rates used for calculations are provided in a caption of each figure presenting results of the calculations.

The author considers focusing on the concentrations as a drawback of the ref. 4. However, the reaction rates can be easily obtained by calculating derivatives. The reader can simply draw approximate plots of these derivatives on a piece of paper.

The initially discussed reaction (1) alone should be considered in terms of concentrations of A and B, rather than the product C. The reaction rate  $r_C$  is physically dependent on  $c_A$  and  $c_B$  and the proper equation is  $r_C = k_1 c_A c_B$ . Notice, that the product C may be gaseous. This does not influence the kinetic equation of the reaction (1) alone (first order with respect to A and B). In this case, concentration of C cannot be used in the equation (is always equal to 0). Substituting  $c_A$  and  $c_B$  with  $c_C$  has only mathematical meaning, which is actually pointed out by the author. Moreover, the authors write, that the rate  $r_C$  is proportional to  $c_C$ . This is not true. Notice, that, in author's equation

$$r_C = k_1(c_A^0 c_B^0 - (c_A^0 + c_B^0)c_C + c_C^2)$$

there are both positive and negative terms with  $c_C$ ; the rate is actually decreasing with  $c_C$ . I find this paragraph of the article to be misleading.

Then, the author gives examples of a complete 3-step reaction with different rate constants. The results are given in the form of the rates of product C formation. Noticeably, the authors names "autocatalytic" these processes, for which the calculated curve is parabolic. In the discussion, reactions with different shape of the plots named no autocatalytic: Fig. 1b and initial part in Fig. 4a with "delayed autocatalysis". Notice, that after integration of such a parabolic curve we obtain a sigmoidal shape of concentration-time dependence. In the conclusion section the author points out, that initially increasing reaction rate is a hallmark of an autocatalytic process. This is an initial part of sigmoidal product concentration profile. Thus, I don't see any difference between concentration- based and rate-based approach. Again, rate and concentrations can be derived from each other.