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# Letter to the Editor

## Comments on "Thermal explosion and runaway reaction simulation of lauroyl peroxide by DSC tests, by Mei-Li You, Ming-Yang Liu, Sheng-Hung Wu, Jen-Hao Chi, Chi-Min Shu" (Journal of Thermal Analysis and Calorimetry, 2009;96:777–782)

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Sir,

We read the article by You et al. [1] with interest. The authors investigated the thermal decomposition behaviour of dilauroyl peroxide (lauroyl peroxide, LPO) by means of DSC experiments at different heating rates and extracted the decomposition kinetics by applying different kinetic methods. In addition, they performed some thermal explosion simulations based on the determined kinetics and finally presented some times to maximum rate (TMR) values for different large geometries (0.79–50.27 $m^3$) and storage temperatures (37–250 °C) in Table 6. The calculated TMR range from 2.7 to 12.6 min, if an initial product temperature of 20 °C is assumed.

Our comments on this article are as follows:

- LPO is not an oxidizing agent, the oxygen balance is negative. For a complete combustion reaction, oxygen from other sources is necessary. The oxygen–oxygen bond only rarely decomposes to give free oxygen. It should be noted that organic peroxides and strong oxidizers are not compatible [2].
- The TMR seems to be very short. In our laboratory, we have performed thermal stability investigations of 20 kg LPO. It took days to heat this quantity from 20 to 45 °C, and the substance was thermally stable for at least 7 days at this temperature.
- LPO is a solid substance, as the authors rightly stated. Nevertheless, they assumed that the peroxide decomposes from the liquid state even below the melting point. In our opinion, it is not advisable to neglect the melting as it can act as a thermal barrier.
- The authors detected the melting point at 40 °C. Li and Koseki [3] detected the melting point of LPO at about 48 °C. Both temperatures are higher than 38 °C which is the maximum ambient temperature recommended by the authors. On the other hand, the authors calculated a TMR of 11.6 min for a cylinder of 0.79 $m^3$ at 37 °C storage temperature. Li and Hasegawa [4] proposed two different decomposition kinetics from the solid and the liquid state. Their finding that the 'Thermo-chemical reactivity of LPO in solid phase was feeble' is contradictory to the results which the authors presented.
- The thermal stability of LPO has been investigated intensively [3–5] in the past, but no corresponding literature has been cited by the authors. A comparative discussion with this literature, e.g. on the sensitivity of the methods, would have been useful.
- The deviation between the experimental kinetic parameters presented in Table 5 is considerably high and, therefore, is an indication of a relatively high uncertainty. Of course, this is reflected in the thermal simulations. This should have been discussed by the authors.
- According to the international transport regulations, LPO is classified as solid organic peroxide (UN 3106). The packing instructions allow transporting a maximum net mass of 50 kg in 'soft' packagings. Temperature control is not required. Explosions or thermal runaway reactions may only occur if fundamental guidelines [2] concerning the safe handling of organic peroxides are not followed.

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