

Oxidation of Potato Chips: Correlation of Sensory Evaluation and Chemiluminescence Measurements of Oxidized Potato Chips

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ABSTRACT

Lipid oxidation is a main factor lowering the sensory quality of food. Rancidity resulting from oxidative decay reactions is usually detected with sensory evaluation experts. The Chemiluminescence (CL) method was compared to sensory evaluation using potato chips.

Luminescence is a term for numerous phenomena that are characterized by excited states of electrons that result in the emission of light. When excited electrons relax into their thermodynamically preferred state, photons are emitted. Chemiluminescence refers to luminescence based on chemical reactions, e.g. where chemical energy is converted to light emissions. The sensitivity of the CL method allows examining oxidative decay reactions like fat oxidation at moderate temperatures.

Commercially available potato chips were exposed at 23°C to daylight during 0, 4, 7 and 10 days, respectively. After exposure, potato chips were tested with CL method and in parallel with 4 trained sensory evaluation experts. CL measurements were performed with the single channel basic instrument configuration of ACL Instruments Inc. under isothermal conditions at 100°C during 4 days. Sensory experts evaluated the same potato chips performing triangle tests (2-3 repetitions).

Sensory evaluation experts detected significant difference ($\alpha = 0.05$) only for the chips exposed to day-light during 7 and 10 days. For CL method the resulting oxidation induction time (OIT) values (>84h, 28.2h, 15.4h and 11.1h) were analysed by the tangential method (see Fig. 1). For the 0d-sample, no OIT was measured within the performed time-temperature condition. But 4d-sample showed an OIT of 28.2 h whereas no significant difference was detected by sensory evaluation.

The sensitivity of the CL method seems to be very promising in comparing to the sensory evaluation tests. Further investigations are now in progress where the real time oxidation of potato chips at normal ambient storage condition is supervised with the CL method and parallel sensory evaluation tests.

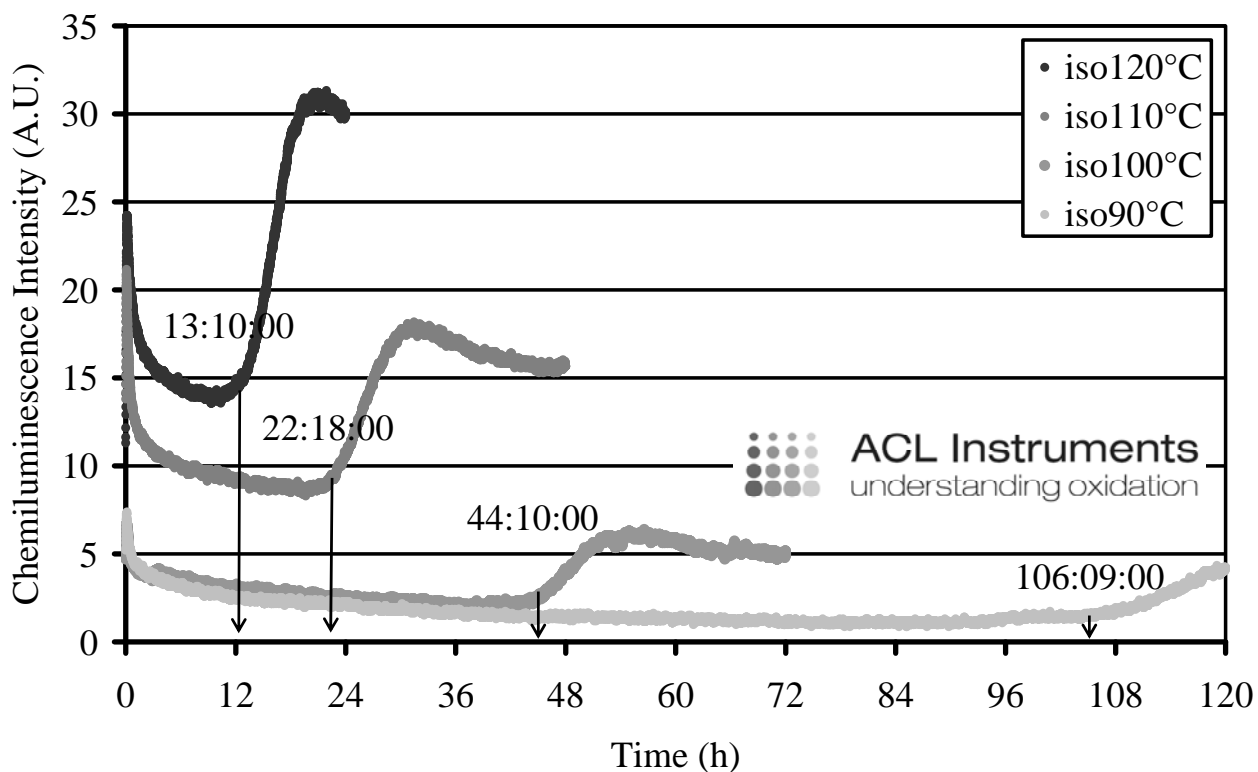


Figure 1: Example of potato chips oxidation followed with Chemiluminescence (sample tested 29d after production) at isothermal testing temperatures (120°C = 13:10, 110°C = 22:18, 100°C = 44:10 and 90°C = 106:19 hh:mm) in synthetic air.

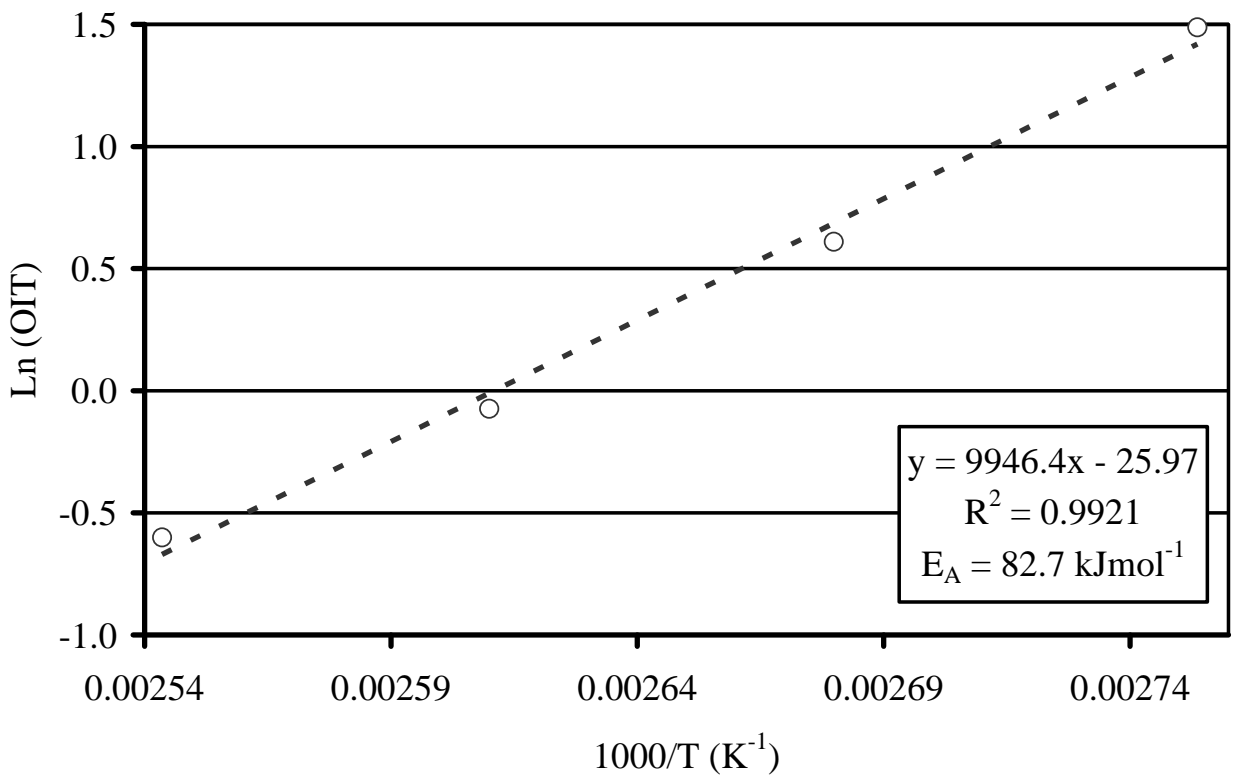


Figure 2: Arrhenius plot of potato chips oxidation onset followed with Chemiluminescence.

