

# Shelf-life prediction of paracetamol formulations through non-isothermal thermogravimetry

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In this work shelf-lives of several paracetamol formulations from different brands worldwide were obtained under variable storage condition. The study was conducted on commercial formulations, which contain active molecules and several excipients, by exploiting non-isothermal thermogravimetry. In pharmaceutical field the estimation of drug shelf-life, without studying the entire real-time decomposition, is a challenge. Consequently, its determination by accelerated conditions is presented in this study and in particular Friedman and Kissinger-Akahira-Sunose (KAS) methods as isoconversional procedures were employed to examine the kinetics of paracetamol degradation. Specifically, activation energy, pre-exponential factor and reaction mechanism were found to investigate the drug stability. Furthermore, the Master plot analysis provided to estimate the mechanism of paracetamol degradation allowing to determine the shelf-lives of each sample.

These simulations can be easily adapted to variable isothermal conditions providing the shelf-lives of the paracetamol tablets at different temperatures. The kinetic characteristics of paracetamol degradation evidenced that the expiration date of these products are significantly influenced by their composition in terms of excipients. To conclude, here non-isothermal thermogravimetry is presented as an efficient tool to predict the shelf-lives of paracetamol formulations under accelerated conditions.

### References

- [1] Calvino, M. M., Lisuzzo, L., Cavallaro, G., Lazzara, G., Milioto S., Non-isothermal thermogravimetry as an accelerated tool for the shelf-life prediction of paracetamol formulation. *Thermochimica Acta* 2021, 700, 178940.