



Faculty of Education  
Chemistry Department

# **Kinetics Studies on Nano-Materials in Solid State**

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**Faculty of Education  
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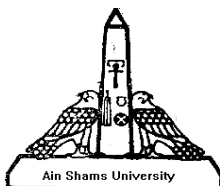
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## Kinetic Studies on Nano-Materials in Solid State

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The influence of particle size on the thermal decomposition of nano-cobalt oxalate dihydrate and nano-lead oxalate,  $\text{Co}(\text{C}_2\text{O}_4)\cdot 2\text{H}_2\text{O}$  and  $\text{Pb}(\text{C}_2\text{O}_4)$  were studied by means of thermogravimetry (TG) technique under non-isothermal and static air conditions. The studied samples and the final products were characterized by means of X-ray diffraction (XRD), Fourier transform infra-red (FT-IR) and transmission electron microscopy (TEM) techniques. The kinetic analysis of the thermal decomposition for  $\text{Co}(\text{C}_2\text{O}_4)\cdot 2\text{H}_2\text{O}$  and  $\text{Pb}(\text{C}_2\text{O}_4)$  was performed by both integral and differential calculation methods including the following procedures: isoconversional methods (model-free) (including the Friedman (FR), Kissinger–Akahira–Sunose (KAS) and Flynn–Wall–Ozawa (FWO) methods) and Four calculation procedures based on single TG curves such as Šatava–Šesták, Madhusudanan–Krishnan–Ninan, Wanjun et al as well as Coats and Redfern methods. Based on the iterative isoconversional calculation procedure, the activation energy values  $E_{it}$  associated of  $\text{Co}(\text{C}_2\text{O}_4)\cdot 2\text{H}_2\text{O}$  and  $\text{Pb}(\text{C}_2\text{O}_4)$  were evaluated. Comparing the kinetic results thirty five reaction models, it was found that decomposition data were well expressed by the Avrami-Erofe'ev model. The values of  $\Delta S^\ddagger$ ,  $\Delta H^\ddagger$  and  $\Delta G^\ddagger$  for the two stages were also computed. The influence of particle size on the thermal decomposition was verified. The results showed that the reactivity of the thermal decomposition increased with decreasing the particle size.

## ABSTRACT

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*Keywords:* nanoparticles; Cobalt oxalate dihydrate; Lead oxalate; Thermogravimetric analysis; Non-isothermal decomposition kinetics; Kinetic models

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