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Thermal decomposition of yttrium propionate: film and powder

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Highlights:

- Thermal decomposition of Y-Prop₃ varies with sample geometry and atmosphere
- Humid O₂ favors the hydrolysis and oxidation decomposition route at low temperature
- An inert atmosphere favors the radical route at high temperature
- Due to gas diffusion phenomena, films tend to follow one path regardless of atmosphere

Abstract

The processes involved in the thermal decomposition of yttrium propionate in oxidizing and inert atmosphere were analyzed with thermoanalytical techniques (thermogravimetry and evolved gas analysis) and with the help of structural characterization (X-ray, diffraction, infrared spectroscopy and elemental analysis) of intermediate and final products. Samples in the form of films and powders were analyzed. The decomposition behavior studied as a function of the particles' size and the film thickness was investigated. We conclude that, as a consequence of the gas and heat transport, films decompose differently than powders. Finally, two decomposition mechanisms are proposed that are in agreement with the observed volatiles and intermediate phases.

Keywords: Yttrium propionate, thermal analysis, TG-MS, TG-FTIR, film pyrolysis, thermal decomposition kinetics, combustion

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