

Thermal decomposition of the calcium salts of several carboxylic acids

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Abstract

A systematic study of thermal decomposition of the calcium salts of eight carboxylic acids, using thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC), is presented. Synthesized calcium salts of carboxylic acids with 3–13 carbon atoms in the aliphatic chain exist as monohydrates that transform into anhydrous salts at about 110 °C, changing their structures and diminishing their crystallinity. Beginning at temperatures between 160 and 315 °C, the salts decompose, forming carbonates as final solid products. From a qualitative point of view, the studied salts show a thermal stability that exponentially decreases with the aliphatic chain length growth. In the temperature interval between dehydration and decomposition, some of the samples suffer a recrystallization process, while others melt. The conclusions possible from thermal analysis were confirmed by monitoring the changes in salt crystallinity with temperature and the appearance of new phases by X-ray powder diffraction (XRD). Infrared (IR) spectroscopy also suggests these conclusions. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

The cooking of corn grains in an alkaline solution of calcium hydroxide, followed by steeping for about 14 h and thorough washing in water to obtain, after grounding the treated maize, a pasty bulk (*masa*) is a common way of obtaining a variety of corn products, such as flat cakes (*tortillas*) in Mexico and other

central American countries. This process, known as *nixtamalization*, brings to corn a high content of calcium and new taste and rheological properties. It has been found that the main form of interaction of calcium with corn components is the formation of salts of carboxylic acids through saponification of grain lipids [1]. It is believed that these salts are responsible for the elasticity of the obtained bulk and for the resistance of these products to spoilage. Calcium salts of aliphatic carboxylic acids have not been systematically studied. However, some of them have been investigated in connection with their uses. The use of calcium salts such as calcium propionate as preservatives is well known in the food industry. The thermal

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