

## Accepted Manuscript

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PII: S0167-577X(18)30486-5  
DOI: <https://doi.org/10.1016/j.matlet.2018.03.121>  
Reference: MLBLUE 24082

To appear in: *Materials Letters*

Received Date: 4 December 2017  
Revised Date: 9 March 2018  
Accepted Date: 17 March 2018

Please cite this article as: L. Chávez-Guerrero, J.A. Salinas-Montelongo, A. Esquivias-Fierro, A simple method to obtain purified CaCO<sub>3</sub> using fly ash as a raw material, *Materials Letters* (2018), doi: <https://doi.org/10.1016/j.matlet.2018.03.121>

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## A simple method to obtain purified $\text{CaCO}_3$ using fly ash as a raw material

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### Abstract

In this work, the fly ash produced from the combustion of agave bagasse, which comprises mainly calcium oxide ( $\text{CaO}$ ), was used to synthesize calcite at room temperature without the use of additives. The interaction between the  $\text{CaO}$  contained by the ash and  $\text{H}_2\text{O}$  generates a primary phase of  $\text{Ca}(\text{OH})_2$ , then, the dissociation of  $\text{Ca}^+$  and the environmental  $\text{CO}_2$  dissolved in water produces a  $\text{CaCO}_3$  film at the interface of water and air. The process was studied by X-ray diffraction (XRD), Raman spectroscopy and scanning electron microscope (SEM-EDX), showing the composition and chemical transformation of the ash up to the  $\text{CaCO}_3$  film formation.

**Keywords:** Calcite, agave bagasse, limestone,  $\text{CO}_2$ , portlandite.

### 1. Introduction

Calcium carbonate ( $\text{CaCO}_3$ ) is recognized as an important food additive in both the construction [1] and pharmaceutical industries [2] and is widely utilized as a filler to reinforce polymers.  $\text{CaCO}_3$  is mainly extracted from limestone, but its mining has a negative environmental impact: introduction of small particles in the air, which results in health problems [3]. Fly ash with high  $\text{CaCO}_3$  content has a wide range of applications, e.g., it is a component in cement [4-5] and block production derived from contaminated sediments [1]. Recently, the demand for  $\text{CaCO}_3$  has increased dramatically, and therefore, the search for new sources of calcite is of great interest [6].

Plants from the *Agavoideae* subfamily, e.g., *Agave salmiana* or *Agave tequilana*, are used as a source of food, fibers, and cellulose. They are also used for bioethanol production and spirit beverages, e.g., tequila and mezcal [7]. In the production of tequila and mezcal, solid, liquid and gaseous wastes such as bagasse, vinasse, and  $\text{CO}_2$ , respectively, are released. Bagasse has been used as a fuel in industrial boilers to produce steam [8], but by burning biomass, waste hazardous to both human health and the environment is produced in the form of fly ash. A common practice is to let the bagasse dry under sun light, followed by incineration to reduce its volume, enabling us to recover energy; however, this process produces large quantities of fly ash [8].

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