



# S.A.P. Mineralogical Project

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## Problem Statement

- **Thousands of tons of Landfill waste each year**  
Trona ash, a residue product from coal-fired power plants is being researched for potential uses as a cementitious material
- **A mixture of two waste materials has great effects**  
Terra Bond, a residue product from an air-pollution control scrubber, has been shown to increase the cementitious properties of Trona Ash
- **Chemistry is key to understanding**

## Research Background

- Trona Ash (TA) is a cementitious waste material of which thousands of tons are being land-filled each year. Ettringite formation has been detected in the material, giving hope that it can be used as a base course or subgrade material.
- Terra bond (TB), mixed with aluminum, has shown cementitious facilitation when mixed with TA.

## Analysis Methods

### X-Ray Powder Diffraction (XRD)

Allows for the analysis of crystal structures within the samples. Especially important these materials because cementitious wastes have crystalline structure.

### X-Ray Fluorescence (XRF)

A full range of the elements found in the samples. This allows for a material balance calculation to find proportional quantities of each crystalline structure.

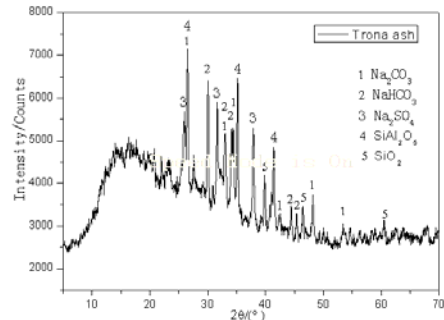
### Scanning Electron Microscope (SEM)

Visual confirmation of the correlation between the composition of a mineral structure and the actual concentrations of certain elements. This technique also allows for an analysis of the physical cementitious structures forming.

### Inductively Coupled Plasma (ICP) Analysis

ICP is another method of determining the elements found in a sample. This will be used to substantiate the findings in the XRF analysis. ICP is being used mostly for testing heavy metals.

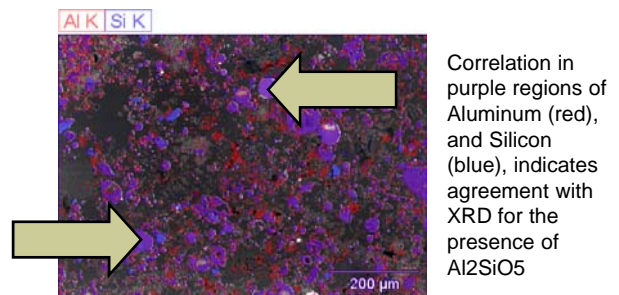
## Analysis of Trona Ash



- Sodium carbonates and aluminum silicates comprise the majority of trona ash samples.
- XRF Analysis is used to correlate these mineral structures to actual composition in a sample.

## Analysis of Trona Ash (cont'd)

Example of an SEM graph of TA. Arrows pointing to concentrations of Aluminum and Silicon, indicating the possibility of  $\text{Al}_2\text{SiO}_5$  minerals (in purple)



## Next Step: More Mineralogy

- Characterizing the TB-Al materials more thoroughly to determine the mineral structure
- Continuing to analyze mixtures of TA, TB, and Aluminum to determine the best combination
- Changing concentrations of the three substances to find the most active cementation possible