Effects of Relative Humidity on Mammoth Molars

Introduction

- Fluctuating relative humidity (RH) damages art and artifacts.
- Natural history artifacts are extremely vulnerable.
- Research on physical effects of environmental changes is lacking.
- Cracking of mammoth molars in fluctuating RH was investigated.

Experimental

Experiment 1

- Samples A-D: Mammoth molar fragments from the Canadian Museum of Nature.
- Exposed to 75%, 35%, and then 75% RH again.

Experiment 2

- Samples: 3 Mammoth molars from the Yukon.
- Exposed to 75% followed by 35% RH.

Results

- Cracks widen and extend after exposure to 75%RH
- Cracks continue to extend after the drop to 35%RH
- Cement adsorbs and desorbs faster than enamel
- FTIR shows presence of hydroxyapatite and water with some carbonate and fluoride substitutions

Measurements and Analysis

Experiment 2:

- Periodic weight measurements.
- Images before, during, and after.
- Images with StackReg analysis of images.
- FTIR and automated sorption isotherm analysis.

Selected Bibliography


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