

Baking Cakes: A Novel Method for Illustrating Processing-Structure-Property Relationships in Materials

Objectives

The primary objective of this exercise is to use the baking of cakes, a commonly recognized process, to illustrate the effects of processing methodology on the resulting structure and properties of materials.

Activity Description

The students bake cakes from scratch. In class, their cakes are examined for surface structure and texture artifacts, cross-sectional morphology, pore size and pore size distribution, and homogeneity. For each observation, a relationship is drawn between the process used to construct the final product and the resulting properties. Relevant processing parameters include raw materials, mixing, forming/casting, and heat treatment.

Grade Levels Intended

This activity has been used in a college level materials processing laboratory course. The students baked cakes at the beginning of the semester and studied them as an introduction to the course. The activity was repeated at the end of the semester after the students had learned processing and characterization techniques. However, this activity can be used with students as early as first grade, but the discussion of the relationships resulting from the activity and the engineering applications must be geared specifically to the audience.

Time Required

The time to make the products ranges from 1.5 to 3.0 hours, depending on the type of recipes attempted and the cooking time for each. The discussion revolving around the final product can take from 0.5 to 1.0 hours. Again, this time is dependent on the audience. We must include an additional 0.5 hours for final characterization – eating the cakes!

Equipment and Supplies

Measuring and mixing implements, pans, ovens and cooling racks are required to prepare the cakes. Wax paper and a cutting implement are required for characterization. A magnifying glass or sheet also can be helpful.

Author

Diane C. Folz

Virginia Tech

Department of Materials Science and Engineering

213 Holden Hall

Blacksburg, VA 24060

dfolz@mse.vt.edu

540-231-3897