**A Paste with a Taste**

**(Modified from an original activity developed by the Women in Mining Education Foundation)**

**Duration:** 40-60 minutes – Grade level 3 and above

**Description:** This activity fits into the curriculum theme of Physical Sciences and Earth Sciences, particularly Earth and Human Activity.

**Goals:** Students will become aware of the utility of different minerals; specifically what minerals can be found in toothpaste and the function each mineral serves.

**Objectives:** Students will make a toothpaste product from two mineral compounds, flavor and color the mixture, and prepare and demonstrate a marketing campaign to “sell” their product.

**Background:** Minerals play an important role in everyday life, including good dental hygiene. Many active ingredients in toothpaste come from minerals, including fluoride compounds, polishing agents, and colorants. Flouride, which comes from the mineral fluorite, coats and strengthens tooth enamel. Quartz, corundum, calcite, and trona (baking soda) are all minerals and are used for the abrasive and cleansing components of toothpaste. Minerals barite and rutile are used to color the paste. In a dental office, the tools and machinery used to clean your teeth are all made from minerals: magnetite and scheelite is used in the steel of the dental picks and drills, uranium and thorium is used for the X-rays of your teeth, galena is used in the lead shield you wear while getting the X-rays. Even the electricity that powers these tools is made possible by minerals, such as copper, which is a conductive component of the wiring that runs through the building.

 **Standards:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Crosscutting Concepts** | **Disciplinary Core Ideas** | **NGSS** | **NVACC** |
| **Scale, Proportion and Quantity** | **PS1.A.** Structure and Properties of Matter | **5-PS1-3.** Make observations and measurements to identify materials based on their properties. | **W.5.7.** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.**W.5.8.** Recall relevant information from experiences or gather relevant information from print and digital sources.**MP.2.** Reason abstractly and quantitatively.**MP.5.** Use appropriate tools strategically. |
| **Cause and Effect** | **PS1.B.** Chemical Reactions | **5-PS1-4.** Conduct an investigation to determine whether the mixing of two or more substances results in new substances. | **W.5.7.** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.**W.5.8.** Recall relevant information from experiences or gather relevant information from print and digital sources. |

**In addition to the science standards listed above, this activity also incorporates elements relative to following directions, writing skills, and performance arts/public speaking.**

**Materials:** This list of materials will supply 8 groups of 4 students each.

* Calcium carbonate powder (available at many health food stores OR use Tums, ground down to a fine powder)
* Sodium bicarbonate (baking soda)
* Artificial sweetener packets or bulk (artificial sweeteners are used in commercial toothpaste)
* 32 small plastic cups
* 32 wooden craft sticks (for stirring)
* 8 eyedroppers
* 8 plastic spoons
* Water
* Measuring spoons
* Assorted food coloring and flavoring
* Samples of commercial toothpaste showing the list of ingredients
* COLOR/FLAVOR menu sheet
* “A Paste with a Taste” information record sheet
* Optional: hand samples of the minerals fluorite, calcite, quartz, corundum, trona, barite, rutile

**Procedure:** Divide class into groups of 4, have each student make their own basic toothpaste recipe (steps 1-3).

1. Combine ½ tsp. of calcium carbonate and ¼ tsp. sodium bicarbonate in a small plastic cup.
2. Use eye dropper to add water to make a paste (about 12-14 drops).
3. Add ¼ packet (about 1/8 tsp.) of artificial sweetener.
4. Have students taste and discuss possible improvements with their group.
5. Decide color/flavor solutions to make the basic recipe more appealing, up to 2 colors and 2 flavors may be used. *Remember, the purpose is to produce the most marketable toothpaste!*
6. Teacher will distribute the different coloring/flavoring combinations to each of the 4 samples.
7. Students will record the number of drops of each color/flavor on their information record sheet.
8. Students will stir color/flavors in using the wooden stir sticks, taste, and discuss with the group.
9. Design a name and marketing campaign for each sample of toothpaste (e.g., slogan, poem, song, dance routine, or commercial), record all information on the information record sheet.
10. Present each toothpaste and marketing campaign to a panel of judges (teacher, or other students) who will taste the samples and determine the most marketable product.
11. Award a prize to the winning sample.

**Review:** How did the homemade toothpaste compare to commercial products? Evaluate labels on the commercial samples, how many types of toothpaste had minerals in them? Have students price compare commercial toothpaste in relation to the number of mineral ingredients. Which are more expensive? Have students discuss various toothpaste TV commercials they have seen, and identify the marketability of each.

**Name(s):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**A Paste with a Taste**

**INFORMATION RECORD SHEET**

**Coloring(s) used:**

**Flavoring(s) used:**

**Name of product:**

**Product sales pitch: Advertising slogan, poem, jingle, song, dance routine, etc.**

**A Paste with a Taste**

**COLOR/FLAVOR MENU**

**(Maximum of 2 flavors and 2 colors)**

*Note – flavors may be processed in a facility that also produces
food causing allergens (ex. peanuts, wheat)*

**Flavors: Colors:**

Anise \_\_\_\_ (Black licorice) Blue \_\_\_

Banana \_\_\_\_ Red \_\_\_

Cinnamon \_\_\_\_ Green \_\_\_

Coconut \_\_\_\_ Yellow \_\_\_

Lemon \_\_\_\_

Lime \_\_\_\_

Orange \_\_\_\_

Peppermint \_\_\_\_

Pure mint \_\_\_\_

Raspberry \_\_\_\_

Strawberry \_\_\_\_

Vanilla \_\_\_\_

**Some Mineral, Rocks, and Elements used in Dental Hygiene:**

**Toothpaste:**

 **Calcite** (calcium carbonate) – polishing compound
 **Fluorite** (calcium fluoride) – protective anti-acid barrier for tooth enamel
 **Quartz** (silicon dioxide) – polishing compound
 **Trona** (sodium bicarbonate) – cleanser and breath deodorant
 **Diatomite** (sedimentary rock made of silica-based algae) – polishing compound
 **Corundum** (aluminum oxide) – polishing compound
 **Rutile** (titanium dioxide) – colorant in white toothpaste
 **Barite** (barium sulfate) – colorant in white toothpaste
 **Mica** – sparkles in some toothpaste

**X-Rays:**

 **Galena** (lead sulfide) – shield against over exposure to x-rays
 **Thorium/Uranium** (radioactive elements) – used in x-ray technology
 **Silver** (metallic element/mineral) – used in electronics and film developing
 **Copper** (metallic element) – copper wiring for electrical power **Gold** (metallic element) – component in electronic circuitry

**Dental Tools:**

**Scheelite** (calcium tungstate) – used as a steel hardener to make durable picks and drill bits
**Nickel** (metallic element) – used in steel-making

**Filling and Crown Materials:**

 **Gold** (metallic element/mineral) – used for dental crowns, fillings and bridges
 **Silver** (metallic element/mineral) – used for dental crowns, fillings and bridges
 **Quartz** (silicon dioxide) – used in porcelain and composite fillings, false teeth, implants
 **Calcite** (calcium carbonate) – used in porcelain and composite fillings, false teeth, implants
 **Clay** (aluminum silicate) – used in porcelain and composite fillings, false teeth, implants