 **NSF Sustainable Energy Grant RET Lesson** 

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| **Lesson Title:** How Crystals are Formed | **Grade Level/Subject:**  1st-5th Grade Science |
| **Maximum # of Students:** Students in Class | **Total Time Required:** 15 minutes/day for 5-10 days |
| **Prior Knowledge Needed:**  Understanding of different types of rock. Understanding different rocks are made in different ways | |

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| **Materials and Preparation:**   |  |  | | --- | --- | | * Heat proof gloves * Salt * Distilled water * Induction Heater * Induction Pot * Microscope with photo capability * Slides | * Propellers * Tubing * Solar panels (2V 400mA) * Multi-meters * Assorted LEDs * Solar motors * Pairs of clamp wires * Wire strippers * Protractors | |

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| **Performance Objectives/Learning Targets:**   * Students will learn rocks can be made of different structures * Students will learn how salt crystals form * Students will understand we can use heat and water to change the properties of a substance | |
| **Standards:** | |
| **Lesson Procedure** | |
| **Before:** | * Lecture on crystal formation and rock types * Set up all materials somewhere all students can see the process * Describe the process that will be undertaken to the students * Set aside an area to monitor crystal growth progress |
| **During:** | **Ask students what they think will happen to the salt when it is mixed into the water**  **Ask students what will happen when you boil away the water**  **Have students observe the salt crystal slides on their own**  **Have students check salt crystal growth daily**  **Procedure:**  **Steps to be taken as a demonstration for class. Younger students should not be allowed near burners**   1. **Preparing the Solution:**    * Put on heatproof gloves to protect your hands.    * In a small pot, mix a concentrated solution of salt and distilled water. Stir until the salt is completely dissolved. The more salt you add, the more saturated the solution will be, resulting in larger crystals.    * Note: Ensure that the pot is clean and free from any contaminants that could affect crystal growth. 2. **Heating the Solution:**    * Place the pot containing the salt solution on the induction heater or alternative heat source.    * Gradually heat the solution, stirring gently if needed, until it reaches a near-boiling point. Be cautious while handling hot objects and the heat source. 3. **Creating Seed Crystals:**    * Once the solution is heated, remove it from the heat source and allow it to cool slightly.    * Use a clean slide to dip into the solution and retrieve a small amount of liquid.    * Place the slide in a clean area to allow the liquid to evaporate. As the water evaporates, salt crystals will form on the slide. These will act as "seed crystals" for further crystal growth. 4. **Growing Salt Crystals:**    * Carefully pour the remaining salt solution into clean glass beakers.    * Place the beakers in a location where they won't be disturbed.    * Allow the beakers to sit undisturbed for several days to a week, depending on the desired size of the crystals. During this time, the water will continue to evaporate, leaving behind salt crystals. 5. **Observation and Documentation:**    * After the allotted time, use the microscope with photo capability to examine the salt crystals.    * Carefully transfer some of the crystals onto a clean slide for closer observation.    * Take photos of the salt crystals at different magnifications, capturing their shapes, sizes, and any unique features. |
| **After:** | * Have students work through the salt crystal growth activity reflection * Ask the same questions to the class as an open discussion * Allow students to share their salt crystal pictures * Encourage students to compare and contrast their salt crystals |
| **5E Model:** *Engage, Explore, Explain, Evaluate, Elaborate*  Engage: Inquiries: How are crystals made? What are crystals  Explore: Probing questions about crystal expectations  Explain: Pre-activity lecture  Evaluate: Sharing pictures of salt crystals. Completion of reflection sheet  Elaborate: Helping students grow salt crystals. Class discussion afterward | |

*Worksheet attached below*

**Title: Salt Crystal Growth Activity Reflection**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Instructions: Please answer the following questions based on your observations and experiences during the salt crystal growth activity.**

1. **Describe what you observed during the salt crystal growth activity. What did the salt solution look like before you started the activity?**
2. **What changes did you notice in the salt solution as it was heated and allowed to cool?**
3. **How did the salt crystals form in the pot? What did they look like?**
4. **Did you observe any differences in the size, shape, or color of the salt crystals? If so, describe them.**
5. **What do you think caused the salt crystals to form in the beaker?**
6. **How would you describe the texture of the salt crystals? Were they smooth, rough, shiny, etc.?**
7. **Did you notice any patterns or similarities among the salt crystals? If yes, describe them.**
8. **How do you think the salt crystal growth activity relates to what you have learned about materials and their properties in science class?**
9. **What was the most interesting or surprising thing you learned during the salt crystal growth activity?**
10. **If you could change one thing about the activity, what would it be and why?**