

SCSU CRISP CCSA Teacher Module 2016

Title of Module: Exploring Materials: Liquid Crystals

Subject or Unit of Study: Temperature, Properties at the nanoscale, Properties of materials

GRADE LEVEL: ___5+_____

LENGTH OF DEMO/LESSON: _____

STUDENT OBJECTIVES:

Exposes students to the fact that many common substances, such as salt, sugar and ice are crystals and have repeating geometric patterns (Physical Science).

Students will understand that:

- Nanometer-sized things are very small, and often behave differently than larger things do.
- Nanoscience, nanotechnology, and nanoengineering lead to new knowledge and innovations that weren't possible before.

STANDARDS:

NEXT GENERATION SCIENCE STANDARDS

NGSS Performance Tasks	MS-PS1-1. <ul style="list-style-type: none">• Develop models to describe the atomic composition of simple molecules and extended structures.
NGSS Disciplinary Core Ideas (DSI)	PS1.A: Structure and Properties of Matter <ul style="list-style-type: none">• Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.• Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
NGSS Cross-Cutting Concepts (CCC)	CCC-3 Scale, Proportion, and Quantity <ul style="list-style-type: none">• Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
NGSS Science and Engineering Practices (SEP)	SEP 2 – Developing and Using Models <ul style="list-style-type: none">• Develop a model to describe unobservable mechanisms.

COMMON CORE STANDARDS

CC-ELA/Literacy Standards	RST.6-8.7 <ul style="list-style-type: none">• Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-1)
CC-Math	MP.2 <ul style="list-style-type: none">• Reason abstractly and quantitatively. (MS-PS1-1) MP.4 <ul style="list-style-type: none">• Model with mathematics. (MS-PS1-1)

	<p>6.RP.A.3</p> <ul style="list-style-type: none"> • Use ratio and rate reasoning to solve real-world and mathematical problems. (MS-PS1-1) <p>8.EE.A.3</p> <ul style="list-style-type: none"> • Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. (MS-PS1-1)
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MATERIALS:

- Assortment of liquid crystal sheets
- 9v battery
- Snap connector for 9V battery
- Cup of ice
- Liquid Crystal sheets

SAFETY:

Dispose of dead batteries according to law

LEARNER BACKGROUND

Liquid crystals represent a phase in between liquid and solid. The molecules in a liquid crystal can move independently, as in a liquid, but remain somewhat organized, as in a crystal (solid).

These liquid crystals respond to changes in temperature by changing color. As the temperature increases, their color changes from red to orange, yellow, green, blue, and purple.

ASSESSMENT:

STEM CAREERS:

- Materials Scientist
- Researcher
- Engineer
- Environmental Engineer
- Solar Energy Systems Engineers
- Nano-technologist
- Aerospace Engineers
- Computer Hardware Engineers
- Materials Engineers
- Mechatronics Engineers
- Nanosystems Engineers
- Nanotechnology Engineering Technologists
- Nanotechnology Engineering Technicians

ADDITIONAL RESOURCES:

<http://www.nisenet.org/catalog/exploring-materials-liquid-crystals>

TEACHER NOTES: