



Making Metal

Creating New Materials With Alloys and Metal Matrix Composites



Bethesda, MD (NAVSEA Carderock - Navy) -- Engineers are creating alloys to meet specific criteria. The goal is to make metals that wear better for greater longevity. Materials processing involves making or joining different materials in interesting ways such as friction stir welding and centrifuging. Using special techniques, engineers are making new metal composites for Navy ships.

"Metal usually comes out of the ground as an ore. Then you clean it and roast it and it becomes iron or copper or gold."

Amarnath Divecha, research metallurgist

Framework

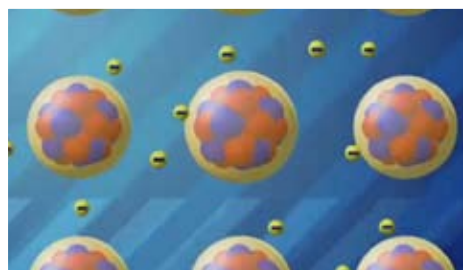
Middle School

Standards

- NSES - B.i.1 ➤ A substance has characteristic properties.
- NSES - B.i.2 ➤ Substances react chemically in characteristic ways.
- STL - 19.F ➤ Manufacturing forms and changes materials through mechanical processes such as separating and combining.
- STL - 19.H ➤ Manufacturing includes design and development.
- STL - 19.J ➤ Materials are extracted from the earth.

Content Illustrated

- Animation of bonded metal atoms with electron cloud.



Content



Physical Science

- Most elements are metals.
- Metals lose their outermost electrons easily, which creates strong metallic bonds among atoms.
- Metals have high melting points and can transfer heat.
- Metals have high conductivity, meaning electrons can easily flow through them.
- Friction generates heat.

Earth & Space Science

- Most metals come from the earth as ores.
- In the earth metals exist as oxides or carbides.

Engineering

- In manufacturing, metals can be stretched, bent, pounded, and combined with other metals.
- Creating alloys changes the properties of metals and can improve their usefulness.
- Welding is a process that joins metals by melting a filler material that cools to become a joint.
- Friction stir welding uses the heat from friction to melt pieces of metal and join them together.

Guiding Questions

- What properties are specific to metals?
How does combining metals improve their use?

Suggested Activities

- Model a centrifuge using beads made of different materials that are all the same size.

Keywords

alloy
carbide
conductivity
electron cloud
friction
friction stir welding
ions
ore
oxide
periodic table