

What Earth Materials are in My Subaru?

By Christine V. McLelland

What does it take to make a car? Where do the materials come from?

Topic: Rocks and Minerals; Mining

Grade Level: 5-9

Standard: Earth and Space Science

Objective: Relating rocks and minerals to their use in our everyday life.

Time Required: Varies

Materials Needed: Copy of mineral sheet

Poster or copies of a picture of car (the bigger the better)

Pictures of minerals and earth materials listed, cut apart (some pictures follow table)

Double-sided tape

Optional: Sticky back Velcro hook and loop fasteners; foam board; Super 77 spray adhesive

PreActivity Question: What is a car made of?

Directions: There are several ways to do this activity. For younger groups, perhaps the poster activity listed below may be more appropriate. For older, do the individual activity.

Poster Activity: Hang a large poster of a car in the front of the room. Distribute the cut-up pictures of the elements and minerals. Have some double-sided tape ready. Have students as a group discuss each earth material and what it is used for. As you discuss each material and decide what it is used for in the car, have the student with the material come up and put that picture in the right spot on the car (for example, the quartz picture can be attached to one of the windows.) Continue until all are finished! *Optional:* To make this activity reusable, I printed a picture of the earth materials, spray glued it onto foam board, cut out each piece and attached a Velcro hook on the back of each. I then put the other side of the Velcro piece (the loop) onto an appropriate spot on the car. Then the students can take their small foam board piece, stick it on to the Velcro, and you can take it off and reuse it for another class.

Individual Activity: Give each student or pair of students a copy of a picture of a car. Give each group a sheet with all the earth materials on it. Have them cut out each mineral and figure out where to place it on the car while reading the handout. Tape the picture to the correct spot.

Evaluation: Have students write a concluding statement about the activity. Ask them leading questions that will bring them to the realization that there are many, many minerals used to make items that we use everyday (i.e. were you surprised at how many different earth materials are used to make a car? Where do all of these earth materials come from? How do we get them?). Good lead in to a discussion or activity on mining.

For some nice color pictures of the elements or minerals, contact me and I will email them to you to print and use.

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The average car is made with over 30 materials extracted from the Earth! Each element, mineral and resource* listed below has special properties that make them important in the production and performance of the car. After reading the descriptions below, take each available picture of the resource and place it in the appropriate position on the car poster. See how many you can get right!

<i>Name of material</i>	<i>Amount in lbs.</i>	<i>Use</i>
Aluminum	240	Light metal used in body of car.
Antimony	Trace	Used to make car upholstery fire resistant.
Asbestos	1.2	Used in brake pads.
Barium	Trace	Used to coat electrical conductors in the ignition system.
Cadmium	Trace	Electrolytically deposited as a coating on metals (steel) to form a chemically resistant coating.
Carbon	46	Used to make iron ore into steel. Steel contains 1% carbon. Also used to add strength to rubber.
Clays	Trace	Used to make ceramics in engine (ex. spark plugs)
Coal	NA	Used to make electricity to produce autos.
Cobalt	Trace	Makes thermally resistant alloys** ('superalloys') in engine.
Copper	42	Used for wiring throughout automobile.
Fluorspar	Trace	Directly or indirectly used to manufacture aluminum, gasoline and steel.
Gallium	Trace	Used in mirrors, transistors and LEDs.
Gold	Trace	Used in the electronics systems.
Iron Ore (see MAGNETITE)	4960	Used to make steel for the frame and engine of the auto.
Lead (see GALENA)	24	From the mineral galena, used in the battery. (960 lbs. of lead ore needed)
Magnesium	4.4	An alloy used to strengthen aluminum and zinc.
Manganese	17.6	Makes an alloy with steel that is tough and resistant to wear for parts such as the axles, pistons, crank shafts and gears. Used in batteries.
Molybdenum	1.0	Used to strengthen steel and lubricants.
Mica	Trace	Fills the shocks.

Nickel	9.0	Used as plating for stainless steel.
Nitrogen	Trace	Used for ceramic materials (spark plugs) and in battery.
Oxygen	Varies	Used for the combustion in engine.
Palladium	Trace	Used as an alloy in electrical contacts.
Petroleum (see gusher, oil rigs, and pipeline pictures)	980	From petroleum we produce plastics (used for the body and interior), rubber tires, paint, synthetic fabrics, gasoline and lubricating oils. Also to make electricity used in the production of the auto.
Quartz sand	170	Used for silica to make glass (85 lbs.)
Silicon	41	Ceramic components.
Strontium	Trace	Used for phosphorescent paint on dials.
Sulfur	2	Used in battery.
Tin	Trace	Alloys with copper, makes solder and lead.
Titanium	Trace	Used to make metallic alloys and as a substitute for aluminum. Also used in paint, lacquers, plastics and rubber.
Tungsten	Trace	Used in filament of light bulbs and for spark plug manufacturing.
Vanadium	1	Used to form alloys that are tough and resist fatigue. Used in axles, crank shafts, gears and other critical components.
Zinc Ore	18 (720 of zinc ore)	Galvanizes screws to be resistant to rust and corrosion. As a filler in rubber tires. Auto industry is the largest consumer.
Zirconium	Trace	Alloy of steel and glass, and used in light bulb filaments.

*** A mineral is an inorganic, solid, homogeneous, crystalline chemical element or compound with a set chemical formula; broadly, a mineral or earth material is: any of various naturally occurring homogeneous substances (such as stone, coal, salt, sulfur, sand, petroleum, water, or natural gas) obtained usually from the ground.**

****An alloy is a substance containing two or more metals, usually created because it has certain more desirable properties than the original metal (ex. stronger, more ductile.)**

NA = figure not available

These materials are mined in the United States and imported from other countries every day. These numbers are from a variety of sources.

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