A World of Minerals in Your Mobile Device

Mobile phones and other high-technology communications devices could not exist without mineral commodities. More than one-half of all components in a mobile device—including its electronics, display, battery, speakers, and more—are made from mined and semi-processed materials (mineral commodities). Some mineral commodities can be recovered as byproducts during the production and processing of other commodities. As an example, bauxite is mined for its aluminum content, but gallium is recovered during the aluminum production process. The images below show the ore minerals (sources) of some mineral commodities that are used to make components of a mobile device. On the reverse side, the map and table depict the major source countries producing some of these mineral commodities along with how these commodities are used in mobile devices. For more information on minerals, visit http://minerals.usgs.gov.

Display

A mobile device’s glass screen is very durable because glassmakers combine its main ingredient, silica (silicon dioxide or quartz) sand, with ceramic materials and then add potassium.

Layers of indium-tin-oxide are used to create transparent circuits in the display. Tin is also the ingredient in circuit board solder, and cassiterite is a primary source of tin.

Gallium provides light emitting diode (LED) backlighting. Bauxite is the primary source of this commodity.

Sphalerite is the source of indium (used in the screen’s conductive coating) and germanium (used in displays and LEDs).

Electronics and Circuity

The content of copper in a mobile device far exceeds the amount of any other metal. Copper conducts electricity and heat and comes from the source mineral chalcopyrite.

Tetrahedrite is a primary source of silver. Silver-based inks on composite boards create electrical pathways through a device.

Silicon, very abundant in the Earth’s crust, is produced from the source mineral quartz and is the basis of integrated circuits.

Arsenopyrite is a source of arsenic, which is used in radio frequency and power amplifiers.

Tantalum, from the source mineral tantalite, is added to capacitors to regulate voltage and improve the audio quality of a device.

Wolframite is a source of tungsten, which acts as a heat sink and provides the mass for mobile phone vibration.

Battery

Spodumene and subsurface brines are the sources of lithium used in cathodes of lithium-ion batteries.

Graphite is used for the anodes of lithium-ion batteries because of its electrical and thermal conductivity.

Speakers and Vibration

Bastnaesite is a source of rare-earth elements used to produce magnets in speakers, microphones, and vibration motors.
If you are holding a cell phone, parts of the world are in your hand! Minerals for consumer products come from all over the world. For example, one of the largest sources of lithium for batteries includes lithium-rich brines in the lithium triangle of Bolivia, Chile, and Argentina.