

# Metals & Mineral Products Used to Make a Solar Panel



- **Arsenic (gallium-arsenide semiconductor chips).** Mined in China, Chile, Morocco, Peru, Kazakhstan, Russia, Belgium and Mexico.
- **Bauxite (aluminum).** Mined in Australia, China, Brazil, India, Guinea, Jamaica, Russia, Venezuela, Suriname, Kazakhstan, Guyana and Greece.
- **Boron Minerals (semiconductor chips).** Mined in United States, Turkey, Argentina, Chile, Russia, Peru, China, Bolivia and Kazakhstan.
- **Cadmium (thin film solar cells).** Mined in China, Republic of Korea, Japan, Kazakhstan, Mexico, Canada, Russia, United States, India, Netherlands, Poland, Germany and Australia.
- **Coal (by-product coke is used to make steel).** Coal is mined world-wide, and constitutes 45% of the generation of U.S. electricity.
- **Copper (wiring; thin film solar cells).** Mined in Chile, United States, Peru, China, Australia, Russia, Indonesia, Canada, Zambia, Poland and Mexico.
- **Gallium (solar cells).** Mined in China, Germany, Kazakhstan and Ukraine.
- **Indium (solar cells).** Mined in China, Republic of Korea, Japan, Canada, Belgium, Russia, Peru and Brazil.
- **Iron ore (steel).** Mined in China, Brazil, Australia, India, Russia, Ukraine, United States, South Africa, Iran, Canada, Sweden, Kazakhstan, Venezuela and Mexico.
- **Molybdenum (photovoltaic cells).** Mined in China, United States, Chile, Peru, Mexico, Canada, Armenia, Iran, Russia and Mongolia.
- **Lead (batteries).** Mined in China, Australia, United States, Peru, Mexico, Canada, India, Bolivia, Poland, Russia, Sweden, Ireland and South Africa.
- **Phosphate rock (phosphorous).** Mined in China, United States, Morocco, Western Sahara, Russia, Tunisia, Jordan, Brazil, Syria, Israel, Egypt, South Africa and Canada.
- **Selenium (solar cells).** Mined in Japan, Belgium, Canada, Russia, Chile, the Philippines, Finland, Peru, Sweden and India.
- **Silica (solar cells).** Mined in United States, Italy, Germany, United Kingdom, Australia, France, Spain, Japan, Poland, Hungary, South Africa, Mexico, Austria, Iran, Republic of Korea, Slovakia, Canada, Belgium, India, Bulgaria, Norway, Chile, Gambia, Turkey and Czech Republic.
- **Tellurium (solar cells).** Mined in Australia, Belgium, Canada, China, Germany, Japan, Kazakhstan, Peru, Philippines, Russia and United States.
- **Titanium dioxide (solar panels).** Mined in Australia, South Africa, Canada, China, India, Norway, Ukraine, Vietnam, Mozambique, United States, Sierra Leone and Brazil.

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## INTERESTING FACTS

In 1954 Photovoltaic technology was born in the United States when Daryl Chapin, Calvin Fuller, and Gerald Pearson developed the silicon photovoltaic (PV) cell at Bell Labs—the first solar cell capable of converting enough of the sun’s energy into power to run everyday electrical equipment.

Molybdenum is “sputtered” onto the photovoltaic cells as a base conductive layer for all the other layers. Sputtering is a process that uses ions of an inert gas to dislodge atoms from the surface of a crystalline material, the atoms then being electrically deposited to form an extremely thin coating on a glass, metal, plastic, or other surface.