

Toxic Chemicals in Solar Panels



Updated April 30, 2018 By David H. Nguyen, Ph.D.

Solar panels may be an appealing choice for clean energy, but they are often contaminated with toxic chemicals. The toxic chemicals are a problem throughout a panel's life -- during its construction -- and at the end of its life.



These two intervals are times when the toxic chemicals can enter into the environment.

The toxic chemicals in solar panels include cadmium telluride, copper indium selenide, cadmium gallium (di)selenide, copper indium gallium (di)selenide, hexafluoroethane, lead, and polyvinyl fluoride. Additionally, silicon tetrachloride, a byproduct of producing crystalline silicon, is highly toxic.

TL;DR (Too Long; Didn't Read)

During manufacture and after the disposal of solar panels, they release hazardous chemicals including cadmium compounds, silicon tetrachloride, hexafluoroethane and lead.

Cadmium Telluride

Cadmium telluride (CT) is a highly toxic chemical that is part of solar panels. In the journal, "Progress in Photovoltaics," it reported that male and female rats that received CT through ingestion did not gain weight as they normally should have. This lack of weight gain occurred at low, moderate and high doses. When inhaled, CT also prevented normal weight gain and caused lung inflammation and lung fibrosis, a hardening of lung tissue. From low to high doses of inhaled CT, the weight of the lungs increased. Moderate to high doses of inhaled CT proved lethal.



Copper Indium Selenide

The study of rats in “Progress in Photovoltaics” showed that ingestion of moderate to high doses of copper indium selenide (CIS) prevented weight gain in females but not males. Moderate to high doses of inhaled CIS increased the weight of a rat’s lungs and increased lung fibrosis. Lungs exposed to CIS produced high amounts of fluid. Another study of CIS on rats, reported in “Toxicology and Applied Pharmacology,” revealed that inhaling CIS caused rats to develop abnormal growths in their lungs.


Cadmium Indium Gallium (Di)selenide

Cadmium indium gallium (di)selenide (CIGS) is another chemical in solar panels that is toxic to lungs. The “Journal of Occupational Health” reported a study in which rats received doses of CIGS injected into the airway. Rats received CIGS three times a week for one week, and then researchers examined lung tissue until three weeks after that. The scientists used a low, moderate and high dose of CIGS. All doses resulted in lungs that had spots that were inflamed, meaning they were damaged. Lungs also had spots that produced excessive fluid. These spots worsened as time went on after the one week of exposure.

Silicon Tetrachloride

One of the toxic chemicals involved with solar panels is not what’s in the panels but is a byproduct of their production. Crystalline silicon is a key component of many solar panels. The production of crystalline silicon involves a byproduct called silicon tetrachloride. Silicon tetrachloride is highly toxic, killing plants and animals. Such environmental pollutants, which harm people, are a major problem for people in China and other countries. Those countries mass-produce solar panels but do not regulate how toxic waste is dumped into the environment. Inhabitants often pay the price.



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convulsions. Inhalation of CFCs can also disturb the heart rhythm, which can lead to death. Exposure to large amount of CFCs could potentially cause asphyxiation, according to the Centers for Disease Control and Prevention.

Other CFC Exposure

Humans can come in contact with CFCs through ingestion or skin contact. After dermal interaction with CFCs, some people might have skin irritation, or dermatitis. According to the New Hampshire Department of Environmental Sciences, exposure to pressurized CFCs, such as that from a refrigerant leak, can cause frostbite on the skin. Direct skin exposure to CFCs has not been linked to cancer, according to the Scottish Environment Protection Agency. Ingestion of CFCs can cause nausea, vomiting, diarrhea or other upset to the digestive tract.



Immune System Deficiency

CFCs can generally impair the human immune system. Direct exposure to problems with the central nervous system.

include difficulty breathing or injury to the heart, kidneys and liver. The University of Georgia also reports that overexposure to the sun suppresses overall immune function or the skin's natural defenses.

Skin Cancer and Eye Damage

CFCs contribute to the loss of the protective ozone layer, which blocks ultraviolet rays from the sun. This exposes more people to UV radiation, which can cause skin cancer. According to the University of Georgia, one in five Americans develops skin cancer in his or her lifetime. Even if they don't develop skin cancer, some individuals experience wrinkled, thick or leathery skin from too much sun exposure. Additionally, increased contact with ultraviolet rays can cause cataracts, macular degeneration and other eye damage.

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