

Raw Materials in PS4:

Where are they and how to recycle them.

PS4 is one of the most famous consoles in the world; over 30 million PS4s have been sold around the world before January 2016. It contains a lot of raw materials, most of which are in the magnet of the hard disk, in the PCBs (printed circuit boards) and in the screen that most of the people use to play.



Raw materials: what are they and where do they come from?

Raw materials are used in the primary production or manufacturing of a good. Raw materials are often natural resources such as oil, iron, and wood.

Before being used in the manufacturing process raw materials are often altered to be used in different processes. Raw materials can be found in our commodities, which are bought and sold on the world market.

China extracts more than 90% of the rare earths that are used in the world. This creates a geopolitical problem because this nation has the control of the products.

PCBs:

A printed circuit board, or PCB, is a self-contained module of interconnected electronic components found in devices ranging from common beepers, or pagers, and radios to sophisticated radar and computer systems. The circuits are formed by a thin layer of conducting material which can be deposited, or "printed," on the surface of an

insulating board known as the substrate.

Individual electronic components are placed on the surface of the substrate and soldered to the interconnecting circuits. Contact fingers along one or more edges of the substrate act as connectors to other PCBs or to external electrical devices such as on-off switches.

The substrate most commonly used in printed circuit boards is a reinforced glass fiber (fiberglass) epoxy resin with a copper foil bonded onto one or both sides. PCBs made from paper-reinforced phenolic resin with a bonded copper foil are less expensive and are often used in household electrical devices.

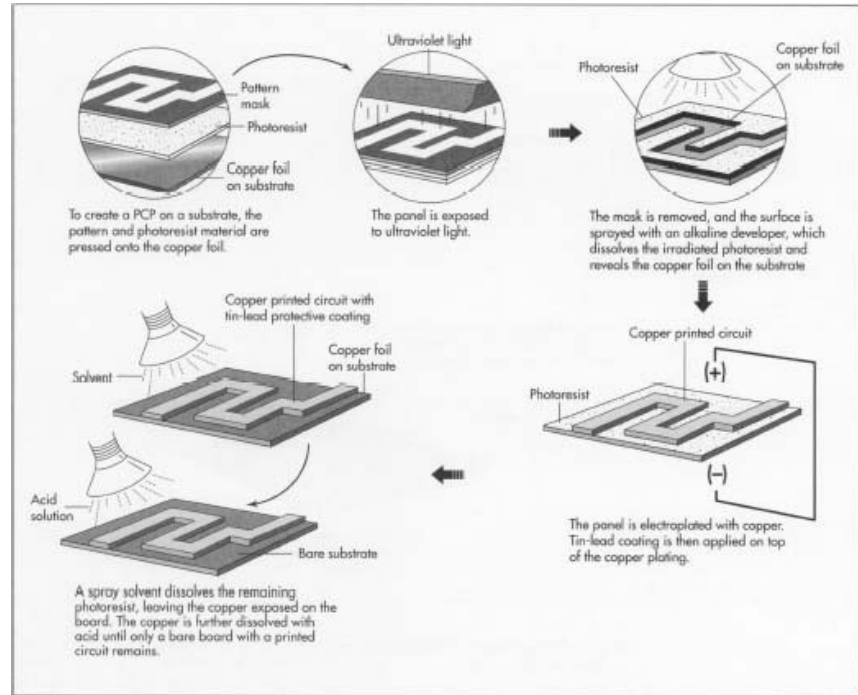
The printed circuits are made of copper, which is either plated or etched away on the surface of the substrate to leave the pattern desired. The copper circuits are coated with a layer of tin-lead to prevent oxidation. Contact fingers are plated with tin-lead, then nickel, and finally gold for excellent conductivity. Purchased components include resistors, capacitors,

transistors, diodes, integrated circuit chips, and others. Many electronic products containing PCBs have recently become obsolete within 12-18 months. The potential for these obsolete products entering the wastestream and ending up in landfills has concerned many environmentalists. Recycling efforts for electronic products include refurbishing older products and reselling them to customers that do not need, or have access to, newer, state-of-the-art electronics. Other electronics are disassembled and the computer parts are salvaged for resale and reuse in other products. The components made in silicon can be completely recycled. In many European country, legislation requires manufacturers to buy back their used products and make them easily disposable them safe for the environment before disposal. For manufacturers of electronics, this means they must remove and reclaim the toxic solder from their PCBs. This is an expensive process and has spurred research into the development of non-toxic

means of making electrical connections. One promising approach involves the use of water-soluble, electrically conductive molded plastics to replace the wires and solder.

Magnets:

A magnet is a material that can exert a noticeable force on other materials without actually contacting them. This force is known as a magnetic force and may either attract or repel. While all known materials exert some sort of magnetic force, it is so small in most materials that it is not readily noticeable. With other materials, the magnetic force is much larger, and these are referred to as magnets. The Earth itself is a huge magnet. When making magnets, the raw materials are often more important than the manufacturing process itself. The materials used in permanent magnets (sometimes known as hard materials, reflecting the early use of alloy steels for these magnets) are different from the materials used in electromagnets (sometimes known as soft materials, reflecting the use of soft, malleable iron in this application). Barium and the barium compounds used to make barium ferrite permanent magnets are poisonous and are considered toxic materials. Companies making barium ferrite magnets must take special precautions in the storage, handling, and waste disposal of the barium products. Electromagnets can usually be recycled by salvaging the component iron cores and copper wiring in the coil. Partial recycling of permanent magnets may be achieved by removing them from obsolete equipment and using them again in similar new equipment. This is not always



possible, however, and a more comprehensive approach to recycling permanent magnets needs to be developed.

LCDs

A working LCD consists of several components: display glass, drive electronics, control electronics, mechanical package, and power supply. The *display glass*—between which the liquid crystals lie—is coated with row and column electrodes and has contact pads to connect drive electronics (electric current) to each row and column electrode. The *drive electronics* are integrated circuits that supply current to "drive" the row and column electrodes. The *control electronics* are also integrated circuits. They decode and interpret the incoming signals—from a laptop computer, for example—and send them to the drive electronics. The *mechanical package* is the frame that connects the printed circuit boards for the drive and control electronics to the display glass. This package also strengthens and protects the display glass and anchors the entire display to the device using the LCD, whether it is a

laptop computer, a fax machine, or another device. Finally, the *power supply* is an electronic circuit that supplies current to the LCD.

Equipment makers who use LCDs often purchase the power supplies separately. In all LCDs, the liquid crystal is sandwiched between two layers of glass or transparent plastic called *substrates*. Just any glass will not do. If the glass has many sodium or other alkali ions, they can move to the glass surface, combine with any moisture that is there, and alter the electric field pattern and liquid crystal alignment. To eliminate that, LCD makers either use borosilicate glass, which has few ions, or they apply a layer of silicon dioxide to the glass.

The silicon dioxide prevents the ions from touching any moisture. An even simpler solution is to use plastic instead of glass. Using plastic also makes the display lighter. Also the Indium is going to be replaced by other materials like graphene or the ZnO:Al in the ITOs of the displays.