

**!!DON'T  
THROW  
AWAY YOUR  
PHONE!!**

Project

“Il linguaggio  
della ricerca”

**1°B**

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# MAIN PROBLEMS

- **POLLUTION**
- **Rare metals depletion**

# !!POLLUTION!!

A lot of materials and metals used in mobile phones are recyclable !!!!!



# ELEMENTS PRESENT IN A SMARTPHONE

## ELEMENTS OF A SMARTPHONE

ELEMENTS COLOUR KEY: ● ALKALI METAL ● ALKALINE EARTH METAL ● TRANSITION METAL ● GROUP 13 ● GROUP 14 ● GROUP 15 ● GROUP 16 ● HALOGEN ● LANTHANIDE

### SCREEN

**49 In**  
Indium

**8 O**  
Oxygen

**50 Sn**  
Tin

Indium tin oxide is a mixture of indium oxide and tin oxide, used in a transparent film in the screen that conducts electricity. This allows the screen to function as a touch screen.

**13 Al**  
Aluminium

**14 Si**  
Silicon

**8 O**  
Oxygen

**19 K**  
Potassium

The glass used on the majority of smartphones is an aluminosilicate glass, composed of a mix of alumina (Al<sub>2</sub>O<sub>3</sub>) and silica (SiO<sub>2</sub>). This glass also contains potassium ions, which help to strengthen it.

**39 Y**  
Yttrium

**57 La**  
Lanthanum

**65 Tb**  
Terbium

**59 Pr**  
Praseodymium

**63 Eu**  
Europium

**66 Dy**  
Dysprosium

**64 Gd**  
Gadolinium

A variety of Rare Earth Element compounds are used in small quantities to produce the colours in the smartphone's screen. Some compounds are also used to reduce UV light penetration into the phone.

### ELECTRONICS

**29 Cu**  
Copper

**47 Ag**  
Silver

**79 Au**  
Gold

**73 Ta**  
Tantalum

Copper is used for wiring in the phone, whilst copper, gold and silver are the major metals from which microelectrical components are fashioned. Tantalum is the major component of micro-capacitors.

**28 Ni**  
Nickel

**66 Dy**  
Dysprosium

**59 Pr**  
Praseodymium

**65 Tb**  
Terbium

**60 Nd**  
Neodymium

**64 Gd**  
Gadolinium

Nickel is used in the microphone as well as for other electrical connections. Alloys including the elements praseodymium, gadolinium and neodymium are used in the magnets in the speaker and microphone. Neodymium, terbium and dysprosium are used in the vibration unit.

**14 Si**  
Silicon

**8 O**  
Oxygen

**51 Sb**  
Antimony

**33 As**  
Arsenic

**15 P**  
Phosphorus

**31 Ga**  
Gallium

Pure silicon is used to manufacture the chip in the phone. It is oxidised to produce non-conducting regions, then other elements are added in order to allow the chip to conduct electricity.

**50 Sn**  
Tin

**82 Pb**  
Lead

Tin & lead are used to solder electronics in the phone. Newer lead-free solders use a mix of tin, copper and silver.

### BATTERY

**3 Li**  
Lithium

**27 Co**  
Cobalt

**8 O**  
Oxygen

**6 C**  
Carbon

**13 Al**  
Aluminium

The majority of phones use lithium ion batteries, which are composed of lithium cobalt oxide as a positive electrode and graphite (carbon) as the negative electrode. Some batteries use other metals, such as manganese, in place of cobalt. The battery's casing is made of aluminium.

### CASING

**6 C**  
Carbon

**12 Mg**  
Magnesium

**35 Br**  
Bromine

**28 Ni**  
Nickel

Magnesium compounds are alloyed to make some phone cases, whilst many are made of plastics. Plastics will also include flame retardant compounds, some of which contain bromine, whilst nickel can be included to reduce electromagnetic interference.



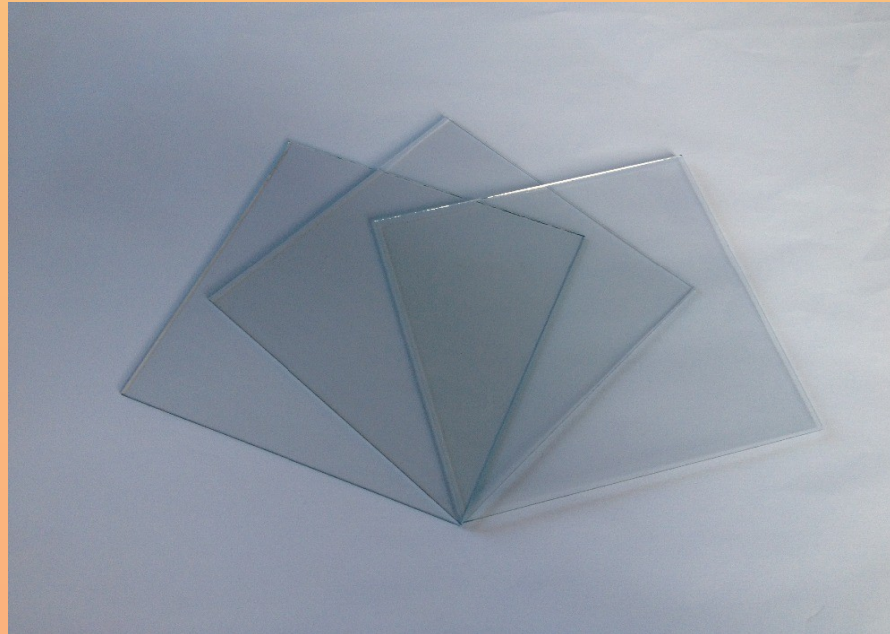
96% of a cell phone can be reused

**RESOURCES ARE  
NOT INFINITE, BUT  
THEY ARE  
NECESSARY FOR  
PROGRESS**

**The 3 most abundant elements on the Earth are:**

- 1. Oxygen**
- 2. Silicon**
- 3. Aluminum**

Indium is a metal that has been used more and more since it is a good conductor and is transparent



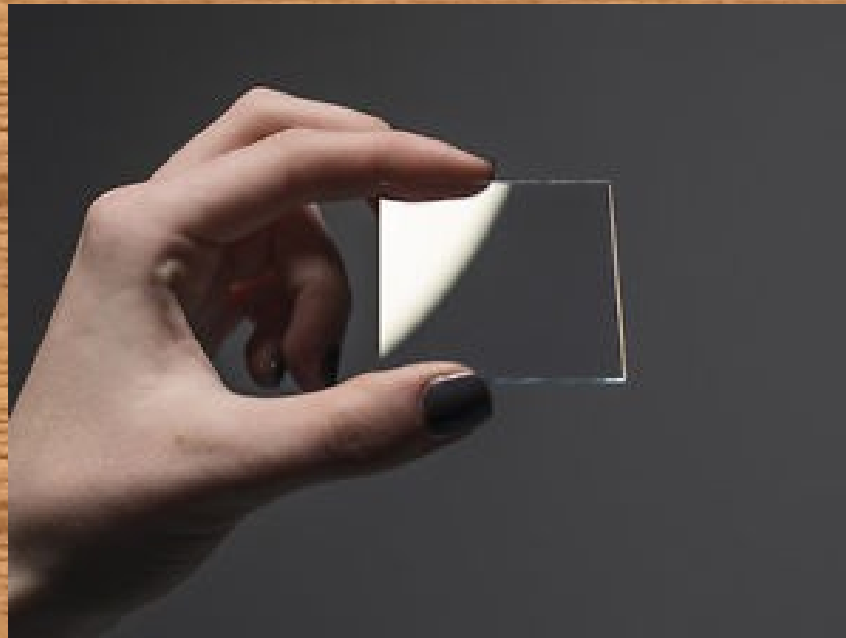
**It is used in:**

- **Flat screens**
- **Solar Cells**
- **SMART WINDOWS**



# 2014

- 1 billion cell phones on the earth
  - 16 million in Italy
  - 4.8 km<sup>2</sup> of Indium oxide





**!!Food for thought!!**

**Mobile phones don't have  
to be thrown away because  
they could help to  
solve many environmental  
issues.**

## Sources:

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