

# Don't throw away your mobile!

## A. Main topics

- Introduction to raw material issues
- Importance of RMs in emerging technologies
- The mobile phone: a treasure in our pockets
- Solutions: miniaturization and substitution
- Case study: indium tin oxide (ITO) and possible substitution by graphene
- Experiment: ITO or graphene?

## B. Targeted audience

14-19 year old students

## C. Key concepts

1. examples of raw materials in emerging technologies: In and Ga in LEDs, REEs in hybrid motors and wind turbines, Lithium and Cobalt in batteries.
2. Different approaches to face RM issues: miniaturization, recycling, substitution.
3. Focus on transparent electrodes in everyday-life devices (touch screens, flat panel screens, LEDs, solar cells).
4. New possibilities beyond ITO substitution: use of graphene in electronics.
  - Explication by linking with the school programme (e.g. insulators, conductors and Ohm law); experimental activity

## D. Experimental activity :

The experience can be performed in the classroom/lab by the students themselves :

- Building-up the circuit for the assessment of conductivity
- observation of current flowing through transparent glasses and plastics coated either by ITO or by graphene

## E. Toolkit material

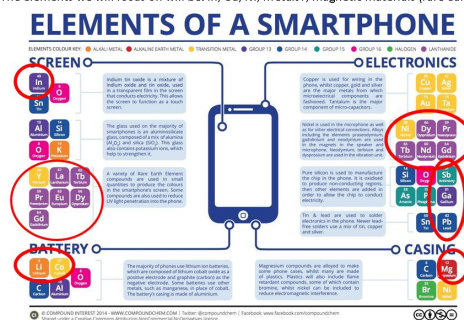
- For the experiment on transparent electrodes: glass and plastic samples coated either with ITO or with graphene; a graphite-tip pencil and one uncoated glass sample; a circuit made up of a battery, an LED and one of the coated samples to be assembled by the students.
- Protocol with the description of the experiment
- Pedagogical dossier with explications, pictures, etc. that can be used by the teacher
  - A video will be released after optimization with the pilot schools

## E. RM Tutor

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The elements we will focus on will be: In, Ga, Ni, Metals?, magnetic materials (rare earths)



[http://www.phonearena.com/news/Smartphone-chemistry-the-secret-materials-that-make-your-handset-tick\\_id60746](http://www.phonearena.com/news/Smartphone-chemistry-the-secret-materials-that-make-your-handset-tick_id60746)