



Metals KS3/4: Comparing the Material Life Cycles of Iron and Aluminium

Lesson Objective:

Students will learn about how iron and aluminium are extracted and why it is more carbon and resource efficient to recycle these metals.

National Curriculum links:

KS3 Chemistry

Materials – use of carbon in obtaining metals from metal oxides;

Earth & Atmosphere – Earth as a source of limited resources and the efficacy of recycling; the production of carbon dioxide by human activity and the impact on climate.

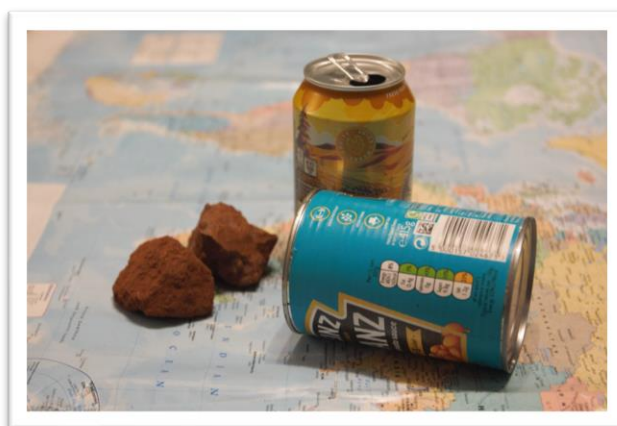
KS4 Chemistry

Chemical Changes – balanced chemical equations, ionic equations and state symbols; electrolysis of molten ionic liquids and aqueous ionic solutions.

Chemical & Allied Industries – Life Cycle Assessment and recycling to assess environmental impacts associated with all the stages of a product's life; the viability of recycling of certain materials.

Resources:

- Samples of steel and aluminium cans
- Samples of iron ore and bauxite
- Large maps of the world
- Post-it notes
- Accompanying sheets about life cycles of aluminium and iron
- Links to videos on iron and aluminium extraction and smelting



Time required: 2-3 hrs

Introduction to Activity:

- Talk about commonly recycled metals – steel and aluminium.
- Talk about recycling at home, what we recycle, why (value of materials, saving resources, saving energy/carbon)

- Ask students to think about where those metal cans come from – mining activities, where in the world?
- Get students to put post-it notes on the maps where they think the raw materials are mined from.

Main Activities:

1. Comparison of extraction methods of iron ore and bauxite (2 hours) – aluminium is extracted via electrolysis, iron is extracted using carbon (metal extracted from metal oxides). This could be covered in two lessons using the videos, sheets and quizzes. See accompanying info sheets.
2. Comparison of distances travelled and carbon footprint of the minerals needed for different extraction methods and the ore, then the materials before production of metals (1 hour). See accompanying info sheets.

Plenary:

Use our accompanying online assessment quizzes to gauge learning during this lesson/set of lessons.

1. Iron extraction in a blast furnace
2. Aluminium extraction – mining and electrolysis
3. Comparing production of metals with recycling of metals

Extension Activity:

Ask students to work out energy values, carbon footprints and distance travelled for each of the 4 materials:

- a. Aluminium from bauxite
- b. Aluminium from recycled aluminium cans
- c. Steel from iron ore
- d. Steel from recycled cans

Extra Resources:

<https://www.bbc.co.uk/bitesize/guides/zfsk7ty/revision/4>
<https://www.bbc.co.uk/bitesize/guides/zqwmxnb/revision/4>
<https://www.bbc.co.uk/bitesize/guides/zpxn82p/revision/2>
<https://www.bbc.co.uk/news/av/magazine-22064711>

Home Learning:

Most of this lesson can be taught at a distance using the videos in the Youtube playlist here: <http://bit.ly/KS3-4RecMetals>