FROM TEACHERS FOR TEACHERS

DIVERSITY IN STEM EDUCATION

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A groundbreaking chemistry experiment !!!

Principles of graphene production in the classroom

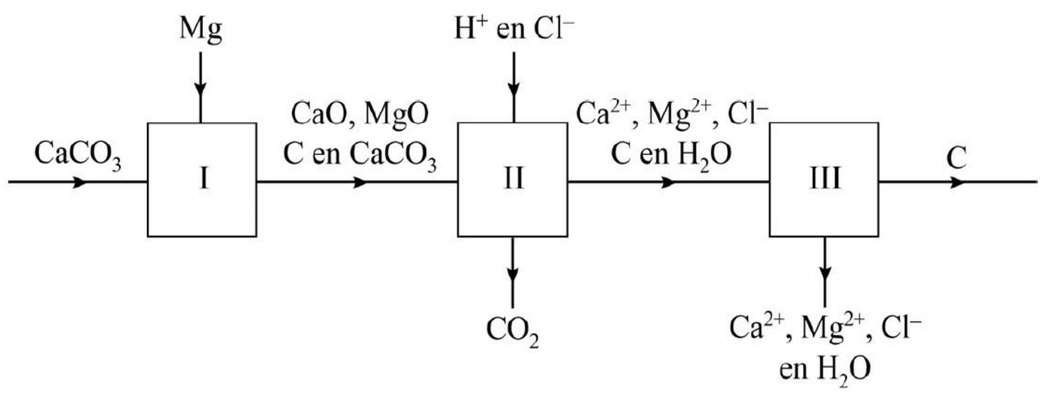
In 2010, a Nobel prize was awarded to the discovery of graphene, which consists of only one layer of carbon-atoms. Graphene is stronger than steel and a very good conductor and holds promise for many applications.

It is very difficult to produce graphene on a large scale. One promising way to produce graphene is in Argon-ovens at temperatures of 850 °C, according to the following reactions:

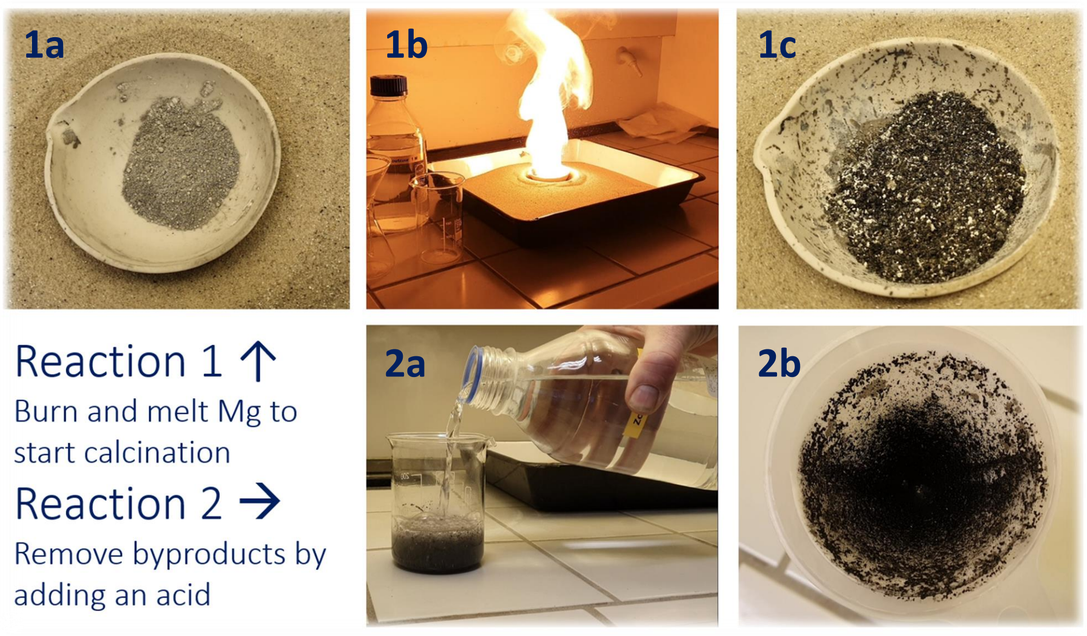
(1) $CaCO_3 + 2\ Mg \rightarrow CaO + 2\ MgO + C$

(2) $CaO + MgO + 4\ H^+ \rightarrow Ca^{2+} + Mg^{2+} + 2\ H_2O$

This process results in a suspension that yields graphene after filtration.



Schools lack Argon-ovens. However, the principles of graphene production can be shown quite easily using an excess of Magnesium. Here we present a chemistry experiment that can be used in school settings.



Explore promising applications of graphene to arouse curiosity and an inquisitive attitude of the student:

Graphene hold promise for applications in batteries, electronics, solar panels, computers, sensors, strong and light materials, medical equipment, space and car technologies and water treatment.

Create interaction with students using following items:

- Describe the reactants and products
- Describe the reaction phenomena
- Explain which phase Mg has in the oven
- Explain why the oven is filled with Argon
- Recognize different molecules, salts and metals
- Which particles react as bases?
- Which 2 gases can theoretically be formed?
- Which starting material has been present in excess?
- Name the type of mixture that arises after reaction 2
- Balance the reaction equation in the correct way
- Draw the filtration setup
- Calculate how many grams of graphene can be formed from 10g $CaCO_3$

Conclusion: the principles of the very complex process of graphene production can easily be shown in chemistry class with a very innovative experiment using Mg

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