

Improving and reducing the cost of graphene production Processes while using crude oil as a primary raw material

Abstract

Graphene is a highly sought-after material with significantly high prices. However, this is not merely due to the economic principle of high demand and low supply. Instead, the primary reason lies in the costly production processes, which yield only a small quantity of graphene per cycle. This research aims to enhance existing graphene production methods by utilizing crude oil as a raw material. Given the diverse types of crude oil available in Saudi Arabia, this approach is expected to accelerate the production process and substantially reduce costs, making graphene more accessible and economically viable.

Introduction & Applications

Aramco produces some of the world's finest crude oils Arabian Heavy, Arabian Medium, Arabian Light, Arabian Extra Light, and Arabian Super Light

Crude oil production 9.2 MMbpd, Total concession hydrocarbon reserves 255.2 billion boe,

Low upstream carbon intensity 10.5 kg of CO₂ per boe.

Graphene was discovered in 2004. It is a 2D material made of carbon atoms arranged in a hexagonal lattice.

Another form of carbon is graphite, where the carbon atoms are laid out and stacked up in sheets.

Graphene is a two-dimensional material composed of carbon atoms in a hexagonal lattice. Derived from a single layer of graphite, graphene measures only 0.33 nanometers thick, much thinner than a human hair. Despite its minimal thickness, it possesses remarkable strength, being over 200 times stronger than steel of the same thickness.

We can produce graphene from oil residues and waste. Given that Saudi Arabia has the strongest oil production line, we are currently dealing with an overflow of oil waste. It is essential to use the oil waste to produce graphene in order to save money. Additionally, I am researching the possibility of accelerating the graphene industry using oil. Asphaltene, a byproduct of crude oil production, is a waste material with potential.

Graphene is used for efficient water desalination, high-capacity lithium-ion batteries, and ultra-fast transistors with biosensing applications.

Methodology

You can access the scientific method in this QR code and in the full scientific paper



Motivation

- Investigate cost-saving modifications in existing production processes (CVD, exfoliation, etc.) by incorporating petroleum based feedstocks.
- Develop scalable methods for transforming petroleum derivatives into carbon sources for graphene production.
- Identify specific hydrocarbons in petroleum suitable for various graphene synthesis methods (CVD, exfoliation, arc discharge).
- Develop guidelines for best practices in petroleum based graphene production for cost reduction and efficiency.
- Finding innovative solutions for the process of converting from crude oil to graphene.

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