

News & Comments

Sustainable Graphene may be Derived from Petroleum Coke

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A crude oil mixture consists of many different hydrocarbons, the light portions becoming natural gas and the heavier portions becoming viscous or solid. Solid petroleum coke is a byproduct of crude oil refinement. Petroleum coke can be used for many purposes, including electrodes for the production of steel and aluminium, but it releases harmful carbon dioxide emissions during the process. Hence, crude oil is being sought as a source of low-emission, high-value materials.

One solution is to convert petroleum coke into graphene, a versatile sheet-like material composed of carbon atoms arranged in a single layer. Exfoliating graphite produces graphene. Graphene can be produced from fossil fuel-derived materials through chemical processes, according to researchers. A team of scientists using a process called electrochemical exfoliation turn petroleum coke into graphene.

Scientist Micah Green said petroleum coke contains graphene-like materials, but the most difficult part is Isolating graphene from the starting material. Electrochemistry was used to accomplish this task. Using a working electrode and a counter electrode, they placed coke into an electrolyte solution. A process called intercalation occurs when negative ions from the electrolyte migrate in between graphene sheets when voltage is applied to the working electrode. A typical lithium-ion battery, which has an electrical conductivity of 150-160 siemens per meter, has a conductivity of about 150 siemens per meter, whereas graphene created from the coke has a conductivity of 50 siemens per meter. Researchers were able to enhance the conductivity of the electrodes even further with a heat treatment called annealing, making them comparable to those used in lithium-ion batteries.

Graphene applications that have been in development for years may be able to be realized by these findings, according to scientists.

"The scaling up of nanomaterials is directly related to existing streams in the petrochemical industry, and I anticipate many more cases in which petroleum-derived chemicals are converted to high-value carbon materials like graphene in the future," the study suggests

KEYWORDS

Synthesis of graphene, sustainable Graphene, electrical conductivity, Exfoliating graphite, graphite

