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GRAPHENE IS THE FUTURE OF DIAGNOSTICS

Carbon has many allotropic modifications. But among them, graphite and a recently discovered modification called graphene are of particular use. In October 2010 A. Geim and K. Novoselov received the Nobel Prize for their discovery.

Graphene is a flat structure of individual carbon atoms arranged in a honeycomb shape. Because it is one atom thick, it is conventionally considered to be a two-dimensional material. Graphene is an excellent conductor of heat and electricity. Among its greatest advantages are also its transparency and extremely high electron flow rate – even higher than that of silicon. In addition, graphene is extremely hard and tensile-resistant.

Several methods for producing graphene have been reported. In general, graphene production can be done by two types of methods, which are top-down and bottom-up.

In the top-down approach, layers of graphite are simply separated to get the graphene layer. But to do this, van der waals interaction between the layers need to be broken. However, there are several challenges with this method such as defects in the surfaces may occur during the preparation of sheets of graphene and the discrete sheets cumulate subsequently. Generally, the top-down approach offers low yield and the process is very tedious. In the bottom-up approach, carbon molecules which are procured from different origins are used as building blocks.

Graphene oxide has unique intrinsic physical as well as chemical properties. Some of the chemical properties include large surface area, functionality containing oxygen, better conductivity and good biocompatibility. The chemical property allows it to be used in bioimaging, biosensing and hypothermia capabilities. 2-D nanosheet graphene contains a single layer of carbon atom arranged hexagonally to increase the surface area, diameter, thickness, stiffness and conductivity.

Graphene has specific catalytic, mechanical, electronic, thermal, biological and optical properties, which allow it to be used for biomolecule recognition, bioassays, molecular medicine and small molecular drug delivery. The biocompatibility and quick functionalization make graphene an assuring platform in tissue engineering, molecular drug delivery, cancer treatment, biosensing, and bioimaging. Graphene-based materials are used in the field of bone repair or organ regeneration.

Graphene is considered to be a revolutionary material. The applications of graphene are truly endless, and many are yet to be conceived of.

Graphene is fused into different composites for applications where quality and weight are restricting components, for instance in aeronautics. Graphene has been introduced to numerous materials to make them more strong, valuable, and light weight. For the aviation industry, a composite material that is substantially lighter than steel yet giving the vital quality will spare cash on fuel utilization, which is the reason graphene has begun to be fused into such materials. Graphene-based basic composites have a gigantic potential to be more utilized as novel options to numerous materials utilized today.

Another possible way to couple these properties for innovative applications is to incorporate graphene sheets in polymeric systems. This could enhance the electrical, thermal and mechanical properties of polymer composites. The engineering of such polymeric materials requires homogeneous dispersion of graphene materials including graphene oxide and graphene derivatives into the polymer matrices.

Graphene and graphene-based composite have exclusive electronic, biological, mechanical, as well as unique optical properties. Researchers nowadays have developed various transistors based on graphene molecules, for use in the biomedical field such as biosensing via fluorescence, cell growth and its differentiation for the treatment of many diseases. Graphene may come up as a unique nanoparticle to be used in the biomedical study by efficient association with various branches of science.

REFERENCES

1. Kulshrestha, S., Khan, S., Meena, R., Singh, B.R., Khan, A.U.: A graphene/zinc oxide nanocomposite film protects dental implant surfaces against cariogenic Streptococcus mutans. Biofouling 30(10), 1281–1294 (2014).

2. Goenka, S., Sant, V., Sant, S.: Graphene-based nanomaterials for drug delivery and tissue engineering. J. Control. Release 173, 75–88 (2014)

3. Shen, J., Zhu, Y., Yang, X., Li, C.: Graphene quantum dots: emergent nanolights for bioimaging, sensors, catalysis and photovoltaic devices. Chem. Commun. 48(31), 3686–3699 (2012).

4. S. He, Y. Qian, K. Liu, C.W. Macosko, A. Stein: Modified-graphene-oxide-containing styrene masterbatches for thermosets. Ind. Eng. Chem. Res., 56 (40) (2017), pp. 11443-11450.

5. G. Mittal, V. Dhand, K.Y. Rhee, S.-J. Park, W.R. Lee: A review on carbon nanotubes and graphene as fillers in reinforced polymer

nanocomposites. J. Ind. Eng. Chem., 21 (2015), pp. 11-25.

6. V. Mittal: Functional polymer nanocomposites with graphene: a review. Macromol. Mater. Eng., 299 (8) (2014), pp. 906-931.

7. L.T. Soo, K.S. Loh, A.B. Mohamad, W.R.W. Daud, W.Y. Wong: An overview of the electrochemical performance of modified graphene used as an electrocatalyst and as a catalyst support in fuel cells. Appl. Catal. Gen., 497 (2015), pp. 198-210.

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END OF THE OIL ERA: BIOTECHNOLOGICAL METHOD OF ARTIFICIAL OIL SYNTHESIS

Organic substances surround us everywhere: in food, in vitamins, in the form of fuel, paper. But an important organic substance that we hear about from television, newspapers, news portals, the substance that determines the development of a country is oil. In the last 20 years, oil has become the main source of production of such substances as gasoline, diesel fuel, aviation kerosene, fuel oil, polyethylene (bags, pipes, films, etc.). But nowadays without new discoveries of oil fields, oil reserves will last for 30 years. And when the oil runs out, the crisis will begin, and therefore scientists around the world are looking for the ways to synthesize a new substance with the same properties.

The aim of the work is to find the optimal method of oil production and its refined products.

Crude oil, liquid petroleum that is found accumulated in various rock formations in Earth's crust and is extracted for burning as fuel or for processing into chemical products. In ancient time, oil was added to body paint or used for rubbing as a tonic. A viscous natural bitumen served as a material for fastening arrowheads and spears. In the writings of ancient historians (Cornelius Tacitus, Strabo), there are frequent references to the extraction of bitumen in the Dead Sea. In the 7th century in Persia, a terrible weapon of that time was created from oil – "Greek fire", the ancestor of napalm.

The modern history of the oil and gas industry started in 1847, with a discovery made by Scottish chemist James Young. Now the following countries, leading in oil production are Russia, the USA, Saudi Arabia, Canada. Now they are engaged in the discovery of a new method related to biotechnology. The oil obtained by the new unique technology is of high