C0r0n@ 2 Inspect

Review and analysis of scientific articles related to experimental techniques and methods used in vaccines against c0r0n@v|rus, evidence, damage, hypotheses, opinions and challenges.

Thursday, August 5, 2021

Graphene oxide can adsorb and absorb CO2

Reference

Rodríguez-García, S .; Santiago, R .; López-Díaz, D .; Merchán, MD; Velázquez, MM; Fierro, JLG; Palomar, J. (2019). Role of the structure of graphene oxide sheets on the CO2 adsorption properties of nanocomposites based on graphene oxide and polyaniline or Fe3O4 nanoparticles. ACS Sustainable Chemistry & Engineering, 7 (14), pp. 12464-12473. https://doi.org/10.1021/acssuschemeng.9b02035

Introduction

1. Before beginning to discuss the properties of graphene oxide with respect to CO2, it is convenient to differentiate and define the concepts of "adsorption" and "absorption". As will be explained hereinafter, graphene oxide can adsorb and absorb CO2 in different nanomaterial configurations.
2. Adsorption is often confused with "absorption". It is the property by which a material manages to adhere atoms, ions or molecules of a gas, liquid or solid. In this case the ability to attract CO2 to the surface of the graphene oxide and keep it glued, adhered or fixed. This attraction effect is similar to "surface tension" whereby water droplets coalesce into larger droplets when their distance is close enough to each other.
3. Absorption is the property of a material to assimilate, integrate or combine with atoms, ions or molecules of a gas, liquid or solid. In the aforementioned case of this entry, it is the ability of graphene oxide to integrate CO2, although it must be anticipated, that it does not achieve it by itself, since it requires third-party nanocomposites and polymers.

Facts

1. The article analyzed on this occasion presents relevant information that would explain the role of graphene oxide in the fight against climate change. The study by (Rodríguez-García, S.; Santiago, R.; López-Díaz, D.; Merchán, MD; Velázquez, MM; Fierro, JLG; Palomar, J. 2019) demonstrates the "adsorbent" properties of oxide graphene in combination with Fe3O4 nanoparticles to reduce CO2 emissions into the atmosphere. The compound of graphene oxide with Fe3O4 is directly linked to the development of anticancer drugs and DNA vaccines (Shah, MAA; He, N.; Li, Z.; Ali, Z.; Zhang, L. 2014), biocides-fertilizers of agricultural use (Zhang, M.; Gao, B.; Chen, J.; Li, Y.; Creamer, AE; Chen, H. 2014), the 5G electromagnetic wave absorption tests (Ma, E.; Li, J. ; Zhao, N.; Liu, E.; He, C.; Shi, C. 2013), the administration of vaccines with genetic reformulations using the CRISPR technique (Abbott,

TR; Dhamdhere, G.; Liu, Y.; Lin, X.; Goudy, L.; Zeng, L.; Qi, LS 2020 | Ding, R. ; Long, J.; Yuan, M.; Jin, Y.; Yang, H.; Chen, M.; Duan, G. 2021 | Teng, M.; Yao, Y.; Nair, V.; Luo, J . 2021), among others. In other words, it is the same compound, which is highly versatile in all cases and applications. That presents a great versatility in all cases and applications. That presents a great versatility in all cases and applications.it is the same compound, which is highly versatile in all cases and applications. that presents a great versatility in all cases and applications. that presents a great versatility in all cases and applications.it is the same compound, which is highly versatile in all cases and applications. that presents a great versatility in all cases and applications. that presents a great versatility in all cases and applications.

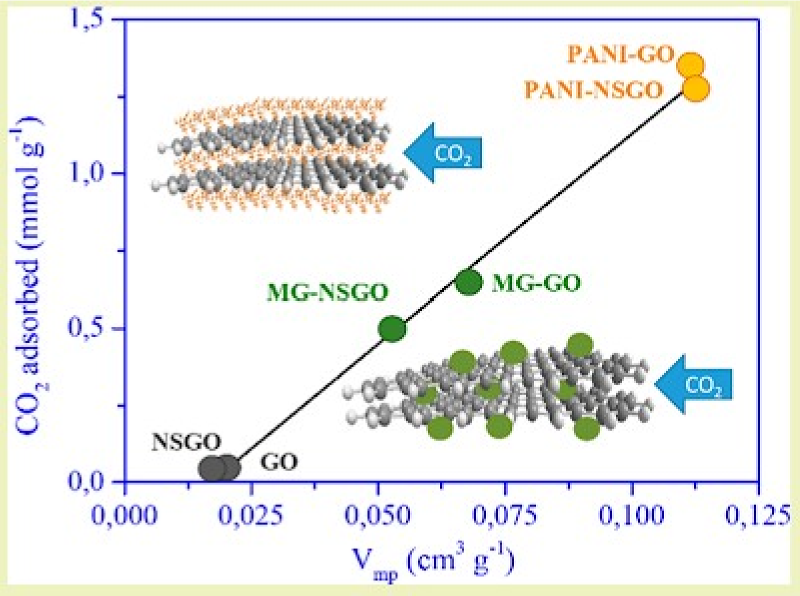

Fig. 1. Diagram of CO2 adsorption reaction with graphene oxide

2. Although graphene oxide has special properties that make it an ideal material for atmospheric filtering and air decontamination, this is paradoxical and contradictory. It should not be forgotten that inhaled graphene oxide (because it is found in suspended particles) is detrimental to health (Ou, L.; Song, B.; Liang, H.; Liu, J.; Feng, X.; Deng, B.; Shao, L. 2016) and can cause significant damage , already described in previous posts, see graphene oxide in blood (Palmieri, V.; Perini, G.; De Spirito, M.; Papi, M. 2019), interaction of graphene oxide with brain cells (Rauti, R.; Lozano, N.; León, V.; Scaini, D.; Musto, M.; Rago, I.; Ballerini, L. 2016), graphene oxide disrupts mitochondrial homeostasis (Xiaoli, F.; Yaqing, Z.; Ruhui, L.; Xuan, L.; Aijie, C.; Yanli, Z.; Longquan, S. 2021), among other articles that they can be retrieved with the following query "graphene toxicity" .
3. Returning to the analysis of the article, it is indicated that " nanocomposites based on graphene oxide with polyaniline (PANI) or nanoparticles of Fe3O4 " are capable of adsorbing and retaining CO2. This special capacity " increases linearly with the volume of micropores ." This detail is relevant, since it agrees with the type of material used in the nucleation of ice, which in the same way had to be porous to obtain a better performance in the formation of nanocrystals (Liang, H.; Möhler, O.; Griffiths, S .; Zou, L. 2019). The porous property is also appreciated in chemical fertilizers (CN107585764A. 刘亚男 ; 何东宁 ; 石伟琦 ; 王 琚 钢 ; 马 海洋 ; 李普旺 ; 冼 皑 敏 . 2020) and curiously in nanoparticles oriented to RNA interference therapies in the brain (Joo, J.; Kwon, EJ; Kang,

J.; Skalak, M.; Anglin, EJ; Mann, AP; Sailor, MJ 2016). In fact, porous graphene is used as an atmospheric nanofilter as pointed out by other authors (Blankenburg, S.; Bieri, M.; Fasel, R.; Müllen, K.; Pignedoli, CA; Passerone, D. 2010) in the form of 2D graphene oxide membranes, which adsorb ammonia, CO2 and argon.

4. Reviewing the introduction of the article interesting statements are observed. Specifically, the justification for the research is summarized in the problem of global warming, which " *constitutes a serious problem for the planet. The increase in the concentration of greenhouse gases, especially CO2, makes it necessary to develop processes for their elimination* ." In this sense, graphene oxide becomes an " *efficient and economical* solution ."to mitigate the effects that this pollutant can cause. Among the options studied in the scientific literature (adsorption and absorption with membranes or chemical absorption in liquid amines), none stands out for having a good balance between performance, energy efficiency and effects However, graphene oxide in the form of hydrogels, aerogels, nanospheres and nanotubes, seem to triple the Co2 capture capacity when functionalized with Fe3O4.
5. The objective of the experiment carried out is to simulate a realistic CO2 adsorption scenario, specifically that produced by a combustion gas. Which leads to think that one of the obvious applications of graphene oxide could be found in the exhaust pipes of combustion engines or in any other industrial combustion process, in fact they point out " *Considering a more realistic scenario corresponding to a gas after combustion (pCO2 = 0.15 bar and pN2 = 0.85 bar), the IAST CO2 / N2 selectivity values obtained from the prepared nanocomposites (graphene oxide) must be improved for effective retention* ". The IAST (ideal adsorbed solution theory) is determined by several factors, firstly the atmospheric pressure expressed in "bar "(unit of pressure bars), atomic weight per gram mmol / g of the graphene oxide catalyst, temperature, CO2 and adsorption time. Researchers conclude that PANI polymer-coated graphene oxide performs better adsorption results at operating temperatures, as well as recyclability properties, being able to modulate its behavior for greater efficiency.
6. Other studies also address the " *absorption*"of CO2 with graphene oxide. For example, the study of (Wu, X.; Zhao, B.; Wang, L.; Zhang, Z.; Zhang, H.; Zhao, X.; Guo, X. 2016) experimented with PVDF (polyvinylidene fluoride) and graphene oxide in different concentrations to create membranes with which the absorption of CO2 was observed under ambient temperature conditions. It was concluded that the increase in the percentage of graphene resulted in an increase in the absorbent capacity of the membrane. In this result, the porosity factor (82% in the experiment) intervened, which was also responsible for the crystallization or nucleation of PVDF, causing a change in shape in the membrane, now with a greater roughness and contact surface with graphene oxide and consequently a higher absorption capacity.An interesting fact is that the membrane did not lose any CO2, even when wet,given the hydrophobic characteristics of PVDF. The study of (Irani, V .; Maleki, A .; Tavasoli, A. 2019) also addresses the absorption of CO2 with nanofluid graphene oxide, combined with MDEA, also known as " *amine mehyldiethanolamine* ", corroborating the capabilities of the material. For example, it has been shown that the addition of 0.2% graphene oxide to MDEA increases its CO2 absorption capacity by more than 10% at different temperatures, which hardly increases the weight of the mixture.

Reviews

1. Graphene oxide can be used to adsorb CO2 from the atmosphere to achieve greenhouse gas reduction. In this sense, it would not be surprising if it was already being used for these purposes, since according to (Pöschl, U. 2005) graphene oxide is found in the analysis of aerosols in the atmosphere together with the soot resulting from the pyrolysis and incomplete combustion of jet aircraft , in a small fraction, which does not get to detail. This provides a very relevant clue that leads to the use of aerial vectors to combat climate change, an aspect that will be discussed in future posts.

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