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.

Wednesday, August 4, 2021

Graphene oxide influences the nucleation of ice in the atmosphere

Reference

Joghataei, M .; Ostovari, F .; Atabakhsh, S .; Tobeiha, N. (2020). Heterogeneous ice nucleation by Graphene nanoparticles. Scientific reports, 10 (1), pp. 1-9.
https://doi.org/10.1038/s41598-020-66714-2

Facts

1. This study investigated how " *graphene oxide-graphene nanoparticle*s ", called " *GGON* ", can serve as the basis for ice nucleation. This is the formation of ice crystals. The researchers observed that GGON nanoparticles with a size between 160 and 180 nanometers, favored the formation of ice crystals at temperatures varying between -20 and -10 degrees Celsius, in a cloud chamber that simulates cloud conditions. aerosol in the earth's atmosphere.

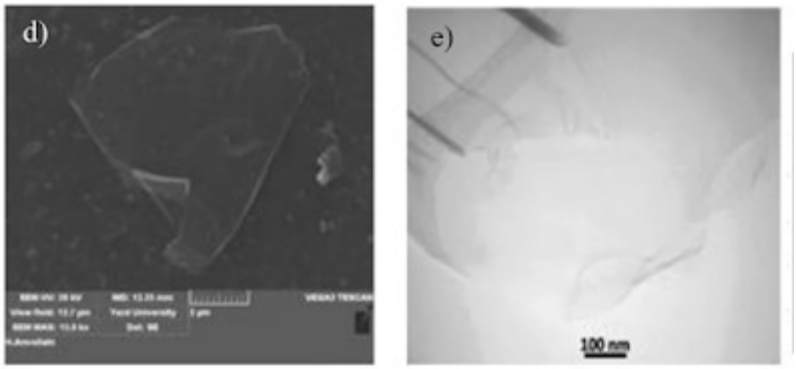

Fig. 1. Microscopy of the graphene-graphene oxide sheets used in the study by (Joghataei, M.; Ostovari, F.; Atabakhsh, S.; Tobeiha, N. 2020)

2. As referred to in the article " *more than 50% of the Earth's precipitation originates in the ice phase and the particles that can serve as ice nuclei (IN) are essential in the microphysics of clouds and precipitation. In addition, nowadays humans try to modify clouds to increase their water resources, and in this context artificial aerosols that contribute to the microphysics of clouds in cloud seeding are desired. Therefore, aerosol-cloud interactions and, consequently, its effects on weather, climate and climate change are among the major global environmental problems . "* This confirms that cloud seeding and its modification via aerosol are common to maximize rainfall and therefore modify the climate.

3. The process of formation of ice crystals in the atmosphere is perfectly detailed: " *the nucleation of heterogeneous ice generally requires an insoluble AP (aerosol particle) to serve as an IN (ice nucleus) that initiates the ice phase through the direct deposition of water vapor , freezing through aqueous medium and by contact, immersion or condensation of specific PA* ". In this case, the element that acts as the AP aerosol particle is the graphene oxide-graphene nanoparticles "*GGON*".

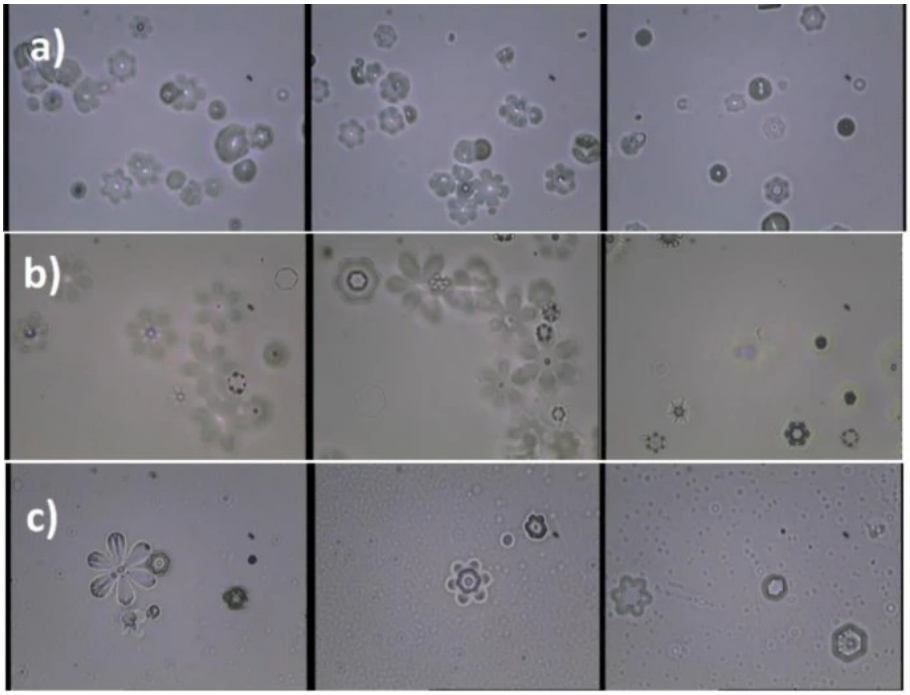

Fig. 2. Ice crystal formation from GGON nanoparticles in row a). In row b) silver iodide "Agl" is observed and in row c) kaolinite powder. (Joghataei, M.; Ostovari, F.; Atabakhsh, S.; Tobeiha, N. 2020)

4. The researchers point out that graphene oxide in the form of GGON has ideal characteristics for the nucleation of ice, due to its two-dimensional structures and thermal and mechanical properties, as they have shown in their experiment, with better results than other materials commonly used. for ice. seeding of clouds, namely " *silver iodide* " and " *kaolinite powder* ". According to the authors, " *although graphene G is hydrophobic, graphene oxide GO is hydrophilic and the existence of these two properties side by side provides the beneficial background for ice nucleation.* " Another factor that favors ice nucleation is the absence or low amount of organic carbon in the material, which positively influences crystallization.
5. Other studies confirm the results described here. For example (Xue, H.; Lu, Y.; Geng, H.; Dong, B.; Wu, S.; Fan, Q.; Wang, J. 2019) states that the density of the " *hydroxyl groups* ", also known as HOPG (Highly oriented pyrolytic graphite, highly oriented pyrolytic graphite), among which is graphene, they increase the nucleation activity of ice. They also make very relevant statements about the importance of the formation of ice in the atmosphere "*the formation of ice crystals is crucial in atmospheric science; For example, ice crystals provide a medium for the exchange of atmospheric molecules and particles within the ecosystem; Ice crystals also act as a reactive host that affects the ozone concentration in the stratosphere . "On the other hand," less oxidized sheets of graphene can nuclear the ice more efficiently* ", which they also come to confirm (Häusler, T.; Gebhardt, P.; Iglesias, D.; Rameshan, C.; Marchesan, S .; Eder, D.; Grothe, H. 2018 | Whale, TF; Rosillo-López, M.; Murray, BJ; Salzmann, CG 2015).

Reviews

1. The nucleation of ice in the atmosphere is a constant in climate research, in order to control rainfall, temperatures and ultimately the water resources, which are increasingly necessary. Silver iodide and kaolinite give way to the use of 2D nanomaterials such as graphene oxide, which are more productive in the formation of ice nanocrystals. The tests carried out by (Joghataei, M.; Ostovari, F.; Atabakhsh, S.; Tobeiha, N. 2020) in a cloud chamber that simulates aerosol conditions in the atmosphere at -20ºC are similar to those that could be found in the troposphere at about 7-8 km high. At the height at which commercial aircraft usually fly, about 10 km (at the limits of the troposphere with the tropopause), the temperature can reach -60ºC. These details are important since, according to (Knopf, DA; Alpert, PA; Wang, B. 2018) states that "*Ice crystals formed in the upper troposphere and in the lower stratosphere (UT upper troposphere / LS lower stratosphere) can sediment, leading to the removal of water and causing dehydration of the UT upper troposphere. This has consequences for the water vapor distribution and therefore the radiation balance considering that water vapor is the strongest greenhouse gas. Ice particles in the tropopause control the transport of water into the lower LS stratosphere, which affects the stratospheric chemical composition. Ice crystal surfaces can serve as heterogeneous surfaces for ozone depleting reactions and act as sinks for HNO3 (nitric acid) .Despite the recognition of the importance of atmospheric ice formation, our predictive knowledge remains insufficient for its representation in climate models*. In other words, if it is true that GO graphene oxide was injected at a height of between 7 and 10 km (upper troposphere and tropopause), to which commercial aircraft usually fly, it not only generates ice nucleation, it also causes the destruction of ozone and the dehydration of the upper troposphere. To these serious problems, we must also add the well-known toxicity and adverse effects of graphene on the body , noted in all the entries in this blog.
2. Therefore, if it is true that graphene oxide fumigation exists in the troposphere, it could pursue several objectives: a) the formation and seeding of clouds; b) precipitation and collection of water resources; c) climate modification / geoengineering. In fact (Liang, H.; Möhler, O.; Griffiths, S.; Zou, L. 2019) in their study they collect the following conclusion "*When observing the nucleation of ice in PrGO-SN compounds (porous graphene oxide and silica dioxide) under E-SEM (Scanning Electron Microscope), we found that the porous compound of PrGO-SN demonstrated the onset of ice nucleation at a higher temperature (-8ºC), as well as a rapid and continuous growth of ice crystals. These findings solidify a greater understanding of the factors that affect the heterogeneous ice nucleation process and shed light on the design and manufacture of efficient functional porous ice nucleating materials for many practical applications, such as rain enhancement and formation. through cloud seeding operations.Future work will involve the cloud chamber experiment as a means of evaluating the performance of this new material in cold cloud seeding to improve rainfall and comparing its ice nucleation efficiency with traditional seeding materials*."This clearly shows that there is the intention and the will, to improve precipitation through the GO graphene oxide ice nucleation method and even measure it with drones specially prepared for the case (Bieber, P.; Seifried, TM; Burkart, J.; Gratzl, J.; Kasper-Giebl, A.; Schmale, DG; Grothe, H. 2020) Therefore, it is not surprising that independent analyzes appear in which graphene oxide nanosheets are found in the rain water .

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