



INSIDE OF NANO

Nanoscience Applications on Space Field

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Nanoscience and Nanotechnologies

Nanoscience is the study and manipulation of materials at the nanoscale, unravel a realm where particles behave in ways that defy conventional understanding. Through powerful tools and interdisciplinary collaboration, scientists unravel the mysteries of this infinitesimal world, paving the way for transformative applications in fields ranging from aerospace to biomedicine. In space exploration, nanotechnology revolutionizes spacecraft design, enabling lighter, stronger, and more resilient vehicles for venturing into the cosmos.

As we peer into the nanoscale universe, we stand on the cusp of a new era of discovery, where the boundaries of possibility are limited only by the depths of our imagination. It holds immense potential for revolutionizing space exploration. In this article, we explore the applications of nanoscience in the space field and highlight Algeria's achievements in satellite technology.



Space Field

Space science is a vast field containing tens of disciplines and its aim is the study of all objects and phenomena taking place in outer space.

A space agency like the Algerian Space Agency (ASAL) is an organization established by a government of countries or regional groupings to establish an engagement in the space field being a domain that sparks innovation and comes with ground breaking discoveries and gaining more information about what lies beyond our planet and even improve our lives on earth.

Applications of space science lies essentially in the design and building of spaceships in the most efficient way in order to travel outside the earth and conduct research in outer space in which many disciplines take place to perform such a formidable task.



Applications of Nano in Space

Aeronautics are known to be one of the most difficult disciplines to learn and apply and their technologies are very complex systems that come with extremely difficult challenges, hence the applications of various new technologies to face these difficulties and perform space exploration and research at the highest efficiency possible, and one of the most formidable candidates to be utilized are nanotechnologies.

The aerospace applications for nanotechnology lie in the utilization of high strength, low weight composites, improved electronics and displays with low power consumption, variety of physical sensors, nanomaterials in tires and brakes and numerous others. Nanotechnologies aid the development of better materials, sensors and power generation, transmission and storage and help fundamentally in In-Situ (meaning in site or in the original place) resources utilization which means the hardware and operations that utilize resources to create products for robotic and human exploration,

Nanotechnology helps through :

- Nano material catalysts substrats for increased active area in self-healing coatings for equipment.

- Insulation material for hot reactors and cold gyro tanks (meaning tanks that are used to store cryogenic liquids which are typically liquefied gases of -150 celsius degrees).

- Nano sensors for hazard (danger) detection and health management.



Figure 1 : Dive into space

Nanotechnologies also comes with the carbon nanotubes that out perform steel in strength, copper in electrical conductivity and diamond in thermal conductivity,

They can be applied in aeronautics in many ways such as in building satellites, as their electrical conductivity has practical uses in antenna design, increasing performance by twenty times above conventional antennas. Furthermore,CNTs conductivity allows for excellent electromagnetic radiation protection.

CNTs are particularly important in improving battery technology since their use as electrode materials enhance energy density while coping with high temperatures, CNT are also valuable additive materials, combining with other elements to build space-ready structures. Their excellent thermal conductivity makes them perfect for producing materials that efficiently absorb light. This feature reduces stray light and is also used as a solar panel coating, substantially improving the solar panel's light-absorbing ability.

As well as carbon nanotubes graphene based nano materials can be of excellence compatibility to solve challenges facing aeronautics and space travel since they are of potential usage in the production of structural materials for aircraft, making them lighter, stronger, and more resistant to wear and tear, furthermore they come in handy in things such as :

- Lightweight Battery and Fuel Cells
- Airborne Antennae And Sensors
- Stealth Technology
- Flexible Electronic Boards



Figure 2 : rocket launch

Experience of Algeria in Astronomy and Space

Algeria has never been short of competent in the domain of space and aeronautics as it is counted to be one of the most promising countries in space activities in Africa due to the work of the Algerian space agency (ASAL)

The Algerian space agency (ASAL) is a national public institution with a special character, enjoying legal personality and financial independence. It was established by Presidential Decree in January 16, 2002

It is an agency for envisioning and implementing the national policy to enhance and develop space activities in the technological, scientific, and applied fields, aiming to contribute to economic, social, and cultural development, and ensuring the security and well-being of the national community.

For the Algerian Space Agency, there is a board of directors comprising representatives from 15 ministerial sectors, as well as a scientific council consisting of experts in the field of space technologies and their applications.

The Algerian Space Agency has accomplished many achievements, mainly the launch of 6 satellites.

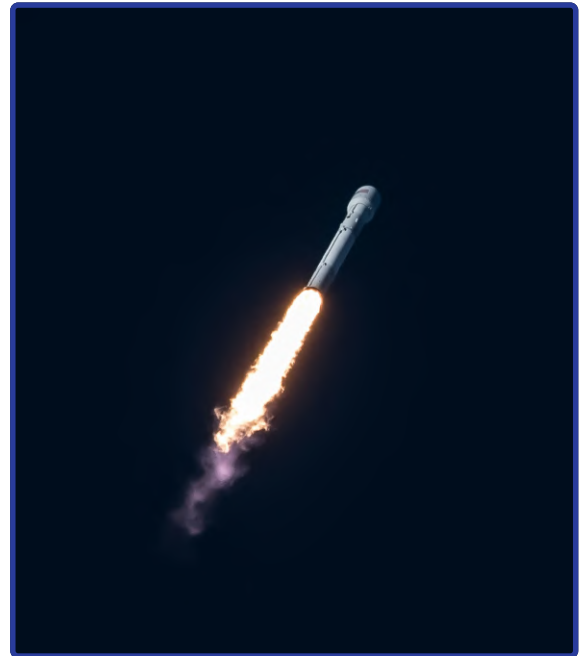


Figure 3 : well designed rocket

In reality, the activities of this agency are not limited to the political aspect, such as overseeing and evaluating international commitments related to regional and international agreements in

the field of space activity. It goes beyond suggesting a bilateral or multilateral cooperation policy that aligns with national needs only. Instead,

it encompasses broader areas where it strives to develop space infrastructure to enhance national capabilities, implement annual and multi-year programs for the development of relevant national space activities across various sectors. This includes ensuring their monitoring and evaluation. The agency also proposes space systems that best suit national concerns to the government and takes responsibility for their design, execution, and utilization on behalf of the state. Naturally, it suggests elements of the national strategy in the field of space activity to the government and ensures their implementation.

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Nanoscience Application on Space Field

In short aeronautics is a thrilling domain and one that comes with tremendous benefits to the human kind, it is a fast developing one that grows every day, it is also a domain that is faced by many difficulties, obstacles and challenges, and the only way to overcome them is through including and applying the newest technologies in the best way possible, nanotechnology being one that has great potential to be harnessed is a promising application that surely will come with great results, ones that could be life changing.



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