Graphene for Advanced Aircraft Airframe

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Future aircraft airframe faces important challenges in terms of eco-efficiency, performance, cost reduction, maintenance and industrialization. Airbus has taken up these challenges and started to consider a large variety of technologies and approaches to develop the next generation smart airframe concept.

Particular challenges emerge from the accelerating shift in materials usage that started some 40 years ago. With aircraft composite structure becoming more and more dominant, the set of requirements to be fulfilled is ever increasing.

While nanotechnologies, including graphene, could not yet compete in all challenging areas of future airframe, several key applications exist, where improvements by nano-reinforcement could not only be shown but were also deemed to offer an economic feasibility. Among them, three key composite airframe application fields have been prioritized:

Barrier Properties:
As an example, to limit water absorption of composite materials will allow designing lighter structures

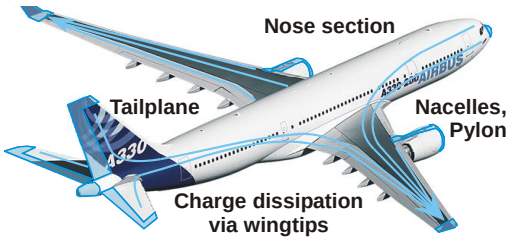
Functional Properties:

Inclusion of the electrical functionality within the aircraft composite structure is of particular interest, as low values turn out to be one of the main disadvantages of the composite use in airframe, which is especially important when it comes to last generation CFRP structure.

Other opportunities include electrical curing of epoxy systems, anti / de-icing, self-sensing, etc.

Mechanical Behaviour:

For resin systems used in CFRP structure, it is of particular concern the fracture toughness, as it directly influences the material behaviour against impact threat. An improvement in matrix fracture toughness by graphene application is immediately translatable into the weight saving of airframe areas subject to increased impact threats.
Additionally, other foreseen composite mechanical improvements by nanomaterial addition also show interest from the structural point of view: enhanced strength, modulus, hardness.



Lightning exit preferably at wingtips