Advanced nanomaterial for aerospace applications

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There are many research efforts in area of new applications of nanostructures for light energy harvesting. Also there are very promising results on mechanic-electricity energy conversion in piezoelectric nanostructures. Our team offer new direction of energy harvesting technologies. It is application of special nanomaterial for direct heat energy conversion in process of elastic interaction with molecules of environmental air or other gas. We can get a new type of aerospace propulsion technologies.

Alexander V. Frolov named this new material Active Force Material (AFM). The propulsion force here is active, i.e. non-reactive. In this project we will develop Active Force Material (AFM). It is plates of some material with one-side nano relief. This relief can provide ordering of chaotically moving molecules of air or other gas medium to provide action of unidirectional force. In other words, special nano relief can create "wind effect" and it works as sail for ship. This force can be used as lifting force for aviation, propulsion force or as force to provide torque of some electro-generator.

Goal of this project is to create new profitable Holding Corporation for innovation of advanced propulsion technology into aerospace and other transport industry. The technology is based on new nanomaterial.

The idea of this international nanotech project came to Alexander Frolov in 2016 after his research laboratory Faraday Ltd. company was closed in Russia. It was 15 years research activity in many directions of advanced propulsion and new energy sources. It is planned to create new company in other country where is high activity of nanotechnological and microelectronics industry, for example, production of computer processors and advanced nanotech labs in area of surface nanoengineering.

Let me say here a few words about the technology. I suppose it is important aspect since any investor want to understand main idea of the innovation project before investing his money.

At first, you must have general understanding of reaction force. A reaction force is a force that acts in the opposite direction to an action force. Rocket or propeller propulsion is result of reaction force.

An action force is result of pressure gradient in environmental media. Sailing ship and aerostat are examples of this technology. Fuel is not necessary for this propulsion method. It is fly due to wind or air pressure gradient. Our idea also is based on gradient of environmental gas pressure.

One more important point for aerospace application is possibility to get the effect in closed sealed box with high pressure gas. In this case we can use it for space ship applications but we need some onboard heat source to provide temperature gradient.

Author started this research topic in 1996, following experiments made by Harry W. Bull, it was published in Popular Science, vol. 126, 1935. In 1996 Alexander V. Frolov demonstrated it for international conference "New Ideas in Natural Sciences", St.-Petersburg, Russia. Scheme of this experiment is Fig.1.

Conclusion from this experiment is very interesting. Interaction of two bodies can provide reactionless propulsion force in the case of different conditions of collision. In experiments above we can see elastic collision from one side (rubber at right side) and non-elastic collision from another side. So, we have here two different conditions of interaction, i.e. impact and impulse. Propulsion force observed here to the side of elastic collision.

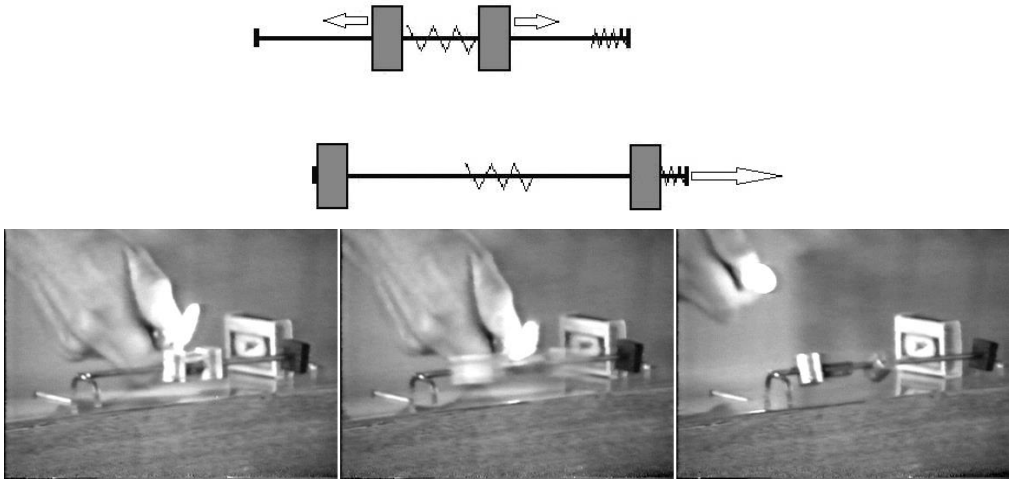

Fig.1 Scheme and photo of Frolov's experiment, 1996

There is a question about the law of conservation of energy. Really, here is no a violation of the law. On one side of the collision we can see transformation of kinetic energy of the moving body into unidirectional force of the device and on another side of collision we can see transformation of kinetic energy of the moving body into heat energy. Amount of the heat here is equivalent to generated unidirectional force.

Practical application of this idea cannot get some real technical solution before nanotechnologies. In 2003 Mr. Michael P. Beshok published an article "Energy of Air", New Energy Technologies magazine, #4 (13), 2003. His ideas were based on application of nanostructures for redirecting of air molecules, Fig.2.

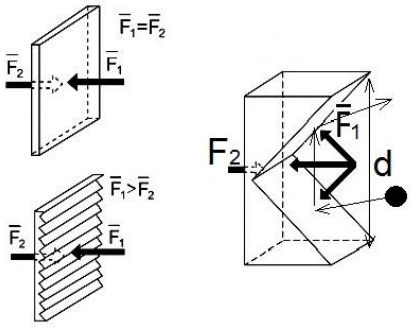

Fig.2 Ideas on redirecting of molecules

Important aspect of this method is related with understanding of molecular motion in scale of 50-100 nm for normal conditions in air (1 Atm and 27C degree). It is average free path length between collisions of molecules. So, in this scale of surface relief we can consider interaction of every molecule instead of statistic situation. Similar relief

we can produce with microelectronic factory or other nanotechnology partner if they can operate with 50-500 nm elements. It can be nanowires, nanorods, nanowalls or other nanostructures.

Perspective of this idea is very nice. Atmosphere air pressure is about 10 ton per sq.m. Let's suppose we can create 10% gradient of air pressure for some experimental setup, it can be a plate with one side surface nanorelief. Theoretically, propulsion force should be about 1 ton per sq.m. Any small experimental setup with surface of several square mm can demonstrate this effect on digital scales. Future prototypes of this technology will demonstrate a flight.

It is not free energy since we will take off part of kinetic energy from molecules of environmental air. So, we will produce force due to some cooling of the environmental. It is direct energy conversion method.

The power of this effect can be sufficient to be commercial valued technology. Normal air pressure is about 10 tons per 1 square meter of any surface, so 10% gradient of pressure will provide force about 1 ton per 1 square meter of surface. Plates of AFM can be joined in 1 cubic meter volume to provide 100 tons lifting force, Fig.3. Also we can plan practical application of this method for any rotation machine to provide powerful torque of the rotor.

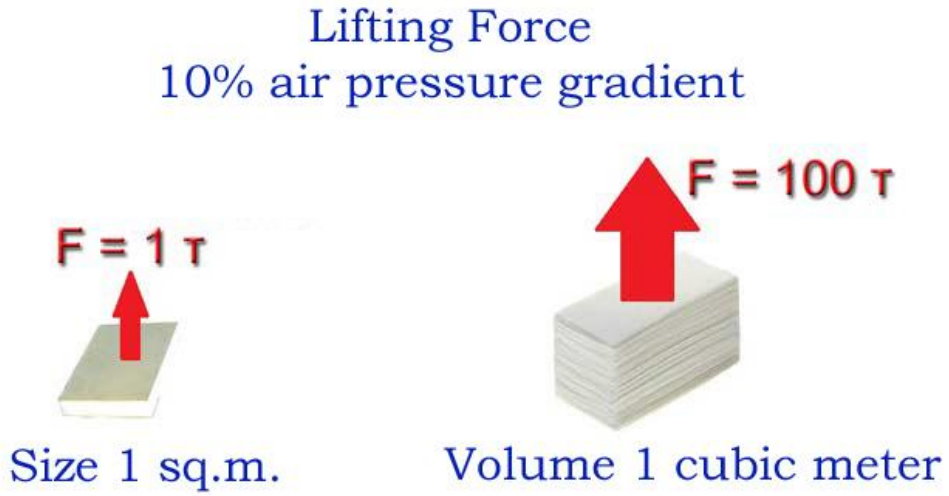

Fig.3 Perspectives of application

It is not free energy "from nothing". AFM will provide direct conversion of environmental heat energy to useful work. We have to harvest part of kinetic energy of gas molecules to convert it in heat radiation due to elastic deformations.

One more time about space applications. In closed sealed box we can create high pressure gas conditions, it will increase the effect in times. In this case we have to provide heat exchange with some onboard heat source to keep the temperature and pressure gradient.

Next step of this project was made in 2011 – 2013 period. Alexander V. Frolov organized delivery of some nanomaterials to his laboratory and started measurements with aerogel and Ti2O3 nanotubes. Results on redirecting were not so significant to

report it. It is obviously that we need to work with elastic nanoelements, for example it can be some small diameter nanowires. Key factor is elastic properties to get the estimated effect of the pressure gradient.

Look at Fig. 4. We have to detect some temperature gradient, for example 2 degrees between top and bottom sides of the plate, Fig.4.

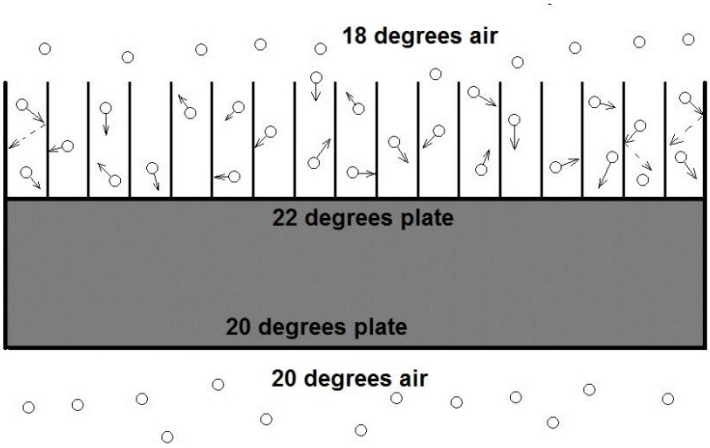

Fig.4 Example of plate with one side surface nanorelief

Future development of this project depends on our partnership with other research labs in the World. My company Faraday Lab ltd. was closed in 2016 and it is planned to create a new research laboratory.

Contact me with proposals on joint experimental work on the topic.

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