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THORIUM-POWERED VEHICLES: NUCLEAR POWER AS AN ALTERNATIVE TO FOSSIL FUELS**S. Yu. Glushkov**

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Environmental issues affect every person on our planet. As increasing evidence supports the devastating effect humans have on the environment, more people are taking steps to protect the environment and educate others about environmental problems. Among top five environmental concerns is air pollution. One of the main causes for this problem is carbon emissions produced by numerous cars. The present paper covers a currently discussed topic of thorium-powered vehicles, as such cars will definitely contribute to mitigation of negative impact on the air. The aim of the paper is to provide reliable scientific foundation for thorium-powered cars potential.

Currently, many people over the world are still reluctant to drive an electric car, though the number of car enthusiasts is constantly increasing. In this regard, the concept of a car powered by thorium could be the ultimate in sustainable transportation, due to the fact it would only need to be re-fueled every 100 years [5]. This concept is introduced by Laser Power Systems (founded in 2007, Connecticut, USA), who claim to take the radioactive element and use it to generate a laser beam that in turn heats water, producing steam and powering the vehicle's engine.

Thorium, discovered in 1828, is abundant in the earth and has been used since in industrial processes. Not only that, thorium just might underlie the future of a plentiful and widespread prosperity on earth, make wars over scarce fossil fuels obsolete, eliminate the release of choking and poisonous pollutants into the atmosphere and make the debate over global warming and climate change a moot point.

The reason uranium won out over thorium at the dawn of the Atomic Age was its ability to undergo fission and provide material for atomic weapons. Thorium was safer, cleaner and more abundant than uranium, but because nuclear weapons could not be built from it, it was relegated to a footnote in atomic energy journals for the past half century.

Today, fossil fuel resources are estimated at today's market rates as having a value of over \$40 trillion. The only way to live in the ground is to find a source or sources of fuel that will undercut fossil fuel prices, making them uneconomical. The recent boom in fracking, which also was of great environmental concern, has put a temporary damper on the use of coal in the United States but this is not the case in other parts of the world where coal is being used.

Every new idea creates resistance and *opposition, and the struggle between its supporters and opponents is inevitable*. The supporters' arguments are simple and obvious - re-fueling once per age is amazing, and what is more, there is no negative environmental impact [3]. Today, it is proved that thorium can be used as a source of thermal energy, almost the same way as uranium is [1], though there is no experience in using the system

of this kind on a small moving platform [2]. Taking into account the advantages of such alternative vehicles, the perspectives of thorium cars usage look impressive (see the comparison below).

Table 1

Thorium	Fossil fuels:
No pollution	Eco damage
High efficiency	Low/medium efficiency
Insignificant amount of fuel used	Great amount of fuel used

However, there is no working prototype of a thorium car now, which makes further discussion of thorium cars groundless. Further research and experiments in this field are hindered by the fact that nuclear power seems to be dangerous for the society. The reasons are obvious – the society have experienced the epic disasters of the past, such as Chernobyl and Fukushima. However, Laser Power Systems' CEO, Dr. Charles Stevens, claims that a single sheet of aluminum foil will provide passengers with enough protection from radiation when riding in the vehicle and that people may get more radiation from one of those dental X-rays than from thorium-powered car [4].

The overview given within this paper clearly demonstrates that currently there is a lack of experimental data to conclude whether the thorium-powered vehicles will become transport of future. It is also important to take into account probable environmental impact, which can be identifies only in the course of the research.

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ENVIRONMENTAL ISSUES RELATED TO “SHALE REVOLUTION”

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Shale gas is a kind of natural gas stored in the reservoirs which are located in the thick layer of sedimentary rock. The reserves of particular gas reservoirs are small; however, if taken together, they would be enormous, which necessitates implementation of special and sophisticated extraction technologies. Shale deposits are found on all continents, thus, virtually any energy-dependent country can provide a necessary source of