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POSSIBLE SOLUTIONS OF THE PROBLEM WITH SPACE DEBRIS

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The aim of this work is to talk about the problem of pollution of the Earth's orbit with space junk and about the possibilities of its purification.

With half a million pieces of space debris cluttering Earth's orbit, according to NASA, this means there is a growing problem of cluttering up our access road to space. Several companies and entities have proposed ways to get rid of derelict satellites and other space junk. In our article we suggest to pay attention to seven recent proposals, ranging from electrical currents to slingshoting for knocking debris down.

Snagging and Moving Space Junk. The e.DeOrbit mission – first proposed publicly in early 2014 – would seek out satellite debris in a polar orbit at an altitude between 800 and 1,000 kilometers (500 to 620 miles). The European Space Agency is considering several kinds of "capture mechanisms" to pick up the debris, such as nets, harpoons, robotic arms and tentacles.

Pushing Debris Out of Space. CleanSpace One, a technology demonstration spacecraft, is expected to launch in 2018 from the back of a modified Airbus A300 jumbo jet. The Swiss Space Systems satellite would then meet up with a decommissioned SwissCube nanosatellite to move it out of orbit.

Space Debris Slingshot. To save on fuel, Texas A&M University's Sling-Sat Space Sweeper proposes swinging capturing an object, swinging it towards Earth's atmosphere, and then using the momentum to sail on to the next piece of space debris for removal. The researchers were still examining design ideas as of early 2013.

Solar Sail. A British proposal called CubeSail would use the drag of a solar sail to push orbiting space debris down to lower orbits. Initially slated to fly in 2011, the proposal is still under design and is expected to build on more recent small satellite experience from its maker Surrey Space Centre, specifically the STRaND-1 nanosatellite that flew in February 2013.

Huffing and Puffing. This method (called Space Debris Elimination, or SpaDE) would push satellites into a lower orbit by using air bursts within the atmosphere. A design proposal from Daniel Gregory of Raytheon BBN Technologies in Virginia would use a balloon or high-altitude plain to send the bursts out, which early studies in 2012 indicated could be enough to disturb the paths of low-Earth orbital debris.

Knock Junk Down with a Net. A network of nanosatellites, connected with a piece of electrically conducting tape that could be as long as 2 miles (3 kilometers), could knock satellites down as it passes through Earth's magnetic field and produces voltage. The solar-powered ElectroDynamic Debris Eliminator (proposed by Star Technology and Research, Inc.) could get rid of all large pieces of satellite debris in low-Earth orbit within a dozen years, its proponents said in 2011 (adding they needed more funding to make it a reality).

Now the problem of pollution of the Earth's orbit is not that relevant as the amount of space debris is not so great to endanger the Earth's population. As we know, people held prevention to not get sick in the future. So if we want to live safety in the future, we should start to clear our orbit now before this debris will start falling down the ground. Thus, we can prevent these terrible consequences.

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STUDY OF SORPTION PROPERTIES OF VERMICULITE

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Currently the pollution of the World ocean is one of the most global and difficult challenges of today. According to UNESCO, 70% of the contaminants are oil and petroleum products [1]. Sorption using various artificial and natural sorbents is a promising method for cleaning weak solutions from petroleum derivatives. However, not all sorbents are effective and environmentally neutral that is why scientists search for new sorbents [4, 6]. Vermiculite concentrate or just vermiculite is one of the most promising sorbents [3]. In this paper we are going to research its properties on oil and galvanic solutions.

Vermiculite (vermiculite concentrate) is a natural mineral from the group of hydrous layered structure which has the unique ability to expand (increase in volume). Expanded vermiculite is obtained by burning [2]. Expanded vermiculite has:

- high fire resistance;
- low thermal conductivity;
- chemical and biological inertness in contact with aggressive media;
- high sorption properties;
- heat and sound insulation properties;
- high absorption capacity;
- no odor [5].

Vermiculite is an undecayable and environmentally friendly material. It does not contain heavy metals [2].

In our research we checked the sorption properties of expanded vermiculite. We used the method of permanganate oxidation (Kubel's method) [4, 6]. To determine the oxidation under static and dynamic conditions, we prepared the model solutions with oil products which concentration is 100 times higher than the maximum permissible concentration. Model oil solutions were prepared the same way: 2 liters of