

Gruntovoy D., Kryzhanovsky S.
D.V. Tsyplenkov, research supervisor
L.A. Zaika, language adviser
National Mining University, Dnipro, Ukraine

The Development Trend Of Lithium-Air Batteries

Soon, there may be a worthy replacement for modern lithium-ion batteries, namely - lithium-air. For quite a long time, the idea of using such a compound was leaping in the minds of scientists, because lithium has the properties of a powerful and light enough reductant, and oxygen in its turn is a free oxidant. Such sources of energy storage can boast of high energy density, which is commensurate with the indicators of liquid fuel, which will positively affect the production of electric vehicles. The passability will be greatly improved and the duration of the car journey will be increased due to the huge increase in the capacity of the battery (from one charge it is twice or three times more than now).

At the moment there are prototypes of lithium-air batteries, but they are far from perfect and mass production. Scientists have to fight with the problems posed, one of which is the excessive accumulation of lithium peroxide on the surface of their electrodes inside the structure of lithium-air batteries. For a very long time, they tried to get rid of this undesirable chemical phenomenon, as it blocked the flow of oxygen, as a result the batteries rapidly lost their capacity.

At the end of 2015, researchers from Cambridge University were able to find out a way to solve this problem, which subsequently increases the capacity of lithium-air batteries by five times in comparison with lithium-ion and modern prototypes of lithium-air batteries. This technology is based on a change in the composition of the electrolyte and the electrode in such a way that the final product of their interaction is a readily soluble lithium hydroxide. However, this method is rather complicated in implementation, which is a significant obstacle.

The scientists from the Argonne National Laboratory decided to get rid of this defect, and focused exclusively on changing the material of the battery electrode. As a result of the work, a new material of electrodes appeared, on the surface of which lithium hydroxide was formed instead of the peroxide, which can be easily broken down into constituent parts: lithium, oxygen and hydrogen. This will even allow the creation of a closed-loop lithium-air battery system that will not need oxygen from the environment, which will make such batteries more reliable and efficient. Lithium superoxide is formed due to the presence of iridium nanoparticles on the surface of the electrode, and iridium atoms play the role of a highly effective catalyst and a reaction stabilizer.

Conclusion: scientists, having done extremely hard work, approached the creation of batteries of a fundamentally new type. But they still have to solve a lot of tasks to improve the processes that take place inside such batteries, which should dramatically increase the duration of their life cycle.